



**Final Project Report**

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CSCI 409: Senior Project II

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## 1. Executive summary

The key objective of this project is to create a centralized system for Nazarbayev University to tackle the issue of fragmented and inconsistent information distribution.

There is currently no centralized news outlet within University. This is a problem because this makes it difficult to keep track of university events. As of right now, event announcements, office hours updates and club news are all spread through weekly digests, email threads and - mainly - independent social media posts by student clubs and organizations. The problem now is that it is very easy for important information to slip under one's radar, and unimportant information to clutter one's field of view.

To address this issue, our team has developed a full-stack corporate web portal for students and staff to consolidate event management, club operations, content publishing, information updates all under one roof. The system allows students and staff to view important information while also giving authorized users - such as DSS or student clubs' administrators - the ability to manage not only their published content but also the gears of their operations. Be it role management, event approval, support requests and attendance tracking - the portal includes many a feature to enhance organizational coordination

The application runs PHP Laravel for backend and PostgreSQL as the database layer. On frontend we run React with Laravel Vite as a building tool and use TypeScript for coding. Interface was designed to strongly adhere to the NU brandbook. For this project we have gone through a complete lifecycle of a computing-based solution.

We began our work by identifying the problem - inconsistent and non centralized information distribution across the Nazarbayev University. Moving into the design phase we planned out the whole web app so that it can support event management, club management, attendance tracking, approval workflows and calendar operations. The design was very user-centered as to help communication between students and university.

In the implementation phase we have developed a full-stack application. The backend is written in PHP using the Laravel framework. The front was written on React and we used Vite for building and TypeScript for coding. We have built a scalable, maintainable and user-friendly system. With features like role management, event approvals, request workflows and support requests to streamline operations and improve coordination between students and university

During the evaluation phase we have focused on assessing how closely we meet the initial objectives and DSS' demands. Based on the evaluations we have been making iterative improvements to address any noticed shortcomings and ensure the system meets the evolving needs of the university community.

In the end we have developed a robust system that meets all of the criteria assigned to us.

## 2. Introduction

Recently, Nazarbayev University has experienced rapid growth not only in its student body, but also in the matter of students' clubs and organizations. With each year the clubs grow larger and larger, events get more and more polished and students get more and more excited. However, the infrastructure for disseminating this information has not evolved accordingly. Currently, to attend the events, students rely on a combination of weekly email digests, sporadic announcements and decentralized social media pages maintained by the individual clubs themselves. To organize the events, clubs rely on messy back and forth communication with DSS to book the venues, request equipment and get their events approved. To keep a track of it all, DSS relies on manual tracking through spreadsheets, email threads, and informal messaging platforms—resulting in delays, miscommunications, and a lack of centralized oversight. This leads to fragmented communication, an overwhelming flow of information and inconsistent visibility of important updates.

This not only makes it difficult for students to keep track of relevant opportunities and updates, but also makes coordinating communication inside and between student organizations and their departments very tedious. There is an urgent need to have a university wide centralized solution that would bring it all together.

To address this issue we have developed a corporate web portal for students and staff, providing a centralized for up-to-date information, event details, students' club information, office hours and contact information. This portal will let clubs publish information about their events, Club Presidents update member lists and club status, users will have access to a Phonebook and a Calendar. The Phonebook will let users search and filter contacts, while the Calendar will let people see the upcoming events and view Professors' office hours schedule.

This report presents the thought process, implementation process and evaluation process of the whole project.

## 3. Background and Related Work

Our University has an existing solution that currently uses many independent systems to manage various aspects of academic and campus life. They are listed below:

- **My NU** is the current internal information portal of Nazarbayev University. It is still used for student club/event management. However, it has not been actively used as a news outlet since the last post was made in April 2023.
- **Moodle:** The central learning management system used for assignments, grades, lecture materials, and attendance tracking.
- **Social Media:** Numerous university entities and clubs rely on platforms like Instagram for event announcements, which results in decentralized and inconsistent communication.

- **Email Digests:** Weekly emails notify event information submitted manually by various clubs and departments.

**Problems with Current Systems.** A high dependence on multiple systems is creating dissatisfaction and frustration for users. To track all this, the users are required to keep switching between Moodle, the registrar, emails, and social media and it is hard to keep track in between. Additionally, social media, emails, and weekly digests are managed by various people with no consistency between them. Also, event registration must be done via multiple platforms with no single view of available rooms or logistics.

**Existing Literature and Related Work.** Our final solution's design and functionality were developed according to the industry standards for corporate intranet systems to ensure the platform is robust, scalable, and user-friendly. We used features such as centralized user management, event booking, and streamlined communication channels for successful implementations in enterprise environments. According to Jones et al. (2020), centralized intranet systems promote communication and cooperation by offering a single point of access to resources, and this is an essential consideration for enterprise-level applications. In addition, combining event booking and user management in one platform is a major success factor in enhancing operations efficiency, as revealed by Roshni and Yadav (2020). Moreover, Patel and Jones (2021) point out that smooth communication flows in enterprise intranets lead to increased user participation and experience.

**Constraints and Guidelines.** Based on prior research, the development of the platform process considered brand compliance, scalability, usability, and access restrictions. We had to ensure that all designs aligned with Nazarbayev University's branding requirements, including consistent use of the official color scheme and logo placement across pages. The system must support thousands of users simultaneously without performance degradation and offer a responsive interface accessible across varying devices. Finally, students and staff must have distinct access privileges such that sensitive information is protected.

## **Methodology**

To address this issue, our team has developed a full-stack corporate web portal for students and staff to manage event management, club operations, content publishing, and information updates all in a combined web application. To solve fragmented information distribution at Nazarbayev University, we chose PHP (Laravel), ReactJS, and PostgreSQL. We chose these technologies after weighing their weaknesses and strengths in constructing a centralized web portal.

**Backend Development:** Laravel, a PHP framework, was chosen due to its rapid development capability, built-in authentication, routing, and Eloquent ORM. Although Node.js presented superior performance and concurrency handling, the security features, ease of use, and extensive support from Laravel's vast community made it more suitable for this particular project, given the university's needs for scalability and maintainability.

Frontend Development: we used ReactJS, the most popular JavaScript library due to its component-based architecture and its smart rendering process using the virtual DOM. ReactJS is geared from a development standpoint to extreme interactions and animation for the UI layer allowing the creation of shareable components that increase development velocity and maintainability. From lightweight library and wellkits, to the ecosystem of libraries React library, offers more flexibility, less restrictions, lighter-weight, and are ideal for building modern web applications, rather than using Angular. Vue.js, another alternative, shares similar benefits, but React's widespread adoption and larger community ensure better support, tools, and resources, which are critical for large-scale projects like ours.

Database Administration: PostgreSQL was selected because of its scalability, ACID compliance, and high-level features like JSONB and full-text search functionality. Compared to smaller databases like SQLite, PostgreSQL is capable of handling complicated queries and large datasets with ease, making it suitable for handling the requirements of the university's growing data. Although it may require more resources and be complex in management, its reliability makes it a suitable choice for the university's growing data.

#### 4. Project Approach

The system allows students and staff to view important information while also giving authorized users - such as DSS or student clubs' administrators - the ability to manage not only their published content but also the gears of their operations. Be it role management, event approval, support requests and attendance tracking - the portal includes many features to enhance organizational coordination.

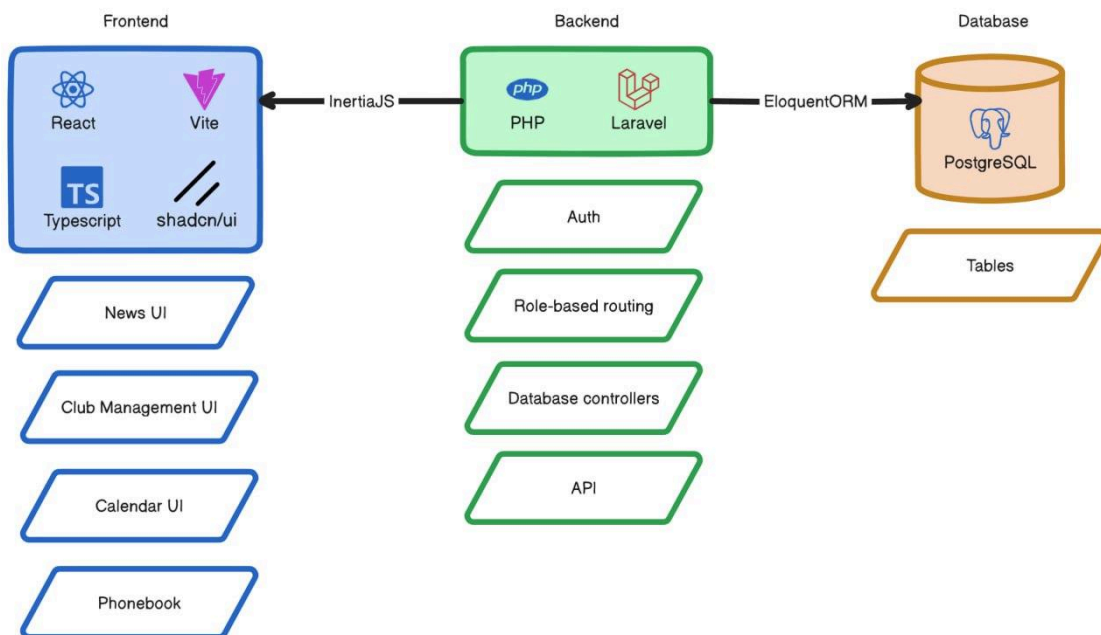


Fig 1. Software architecture visualized

Users in our system are divided into four roles:

- Students
- Professors
- DSS
- IT Department

Our system allows students to view the calendar, view the list of clubs they are in and create new clubs. If the student is a manager/president in a club, the student in question can submit events for approval, submit event support requests and change the list of club's members. Professors can alter their office hours schedule. DSS can approve clubs, events and event support requests. Below are some of the workflows visualized

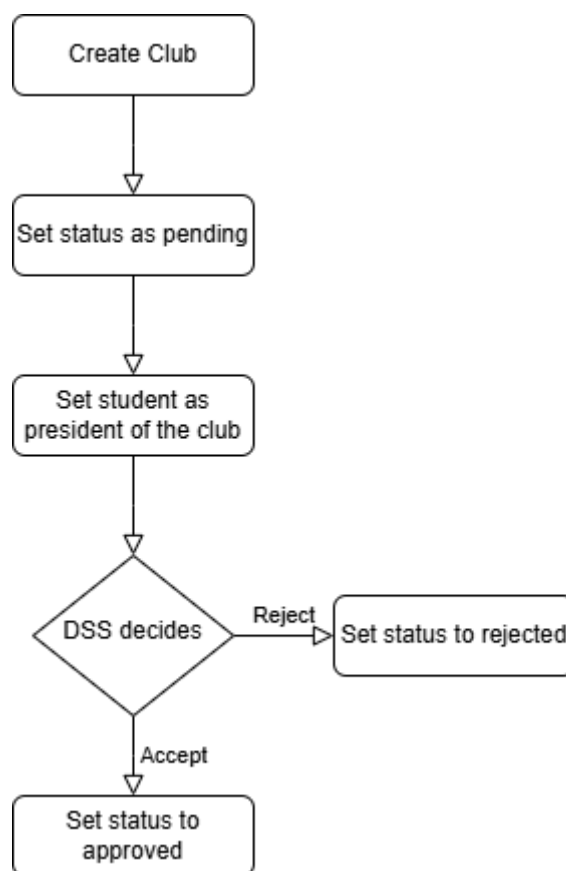


Fig 2. Creating a club

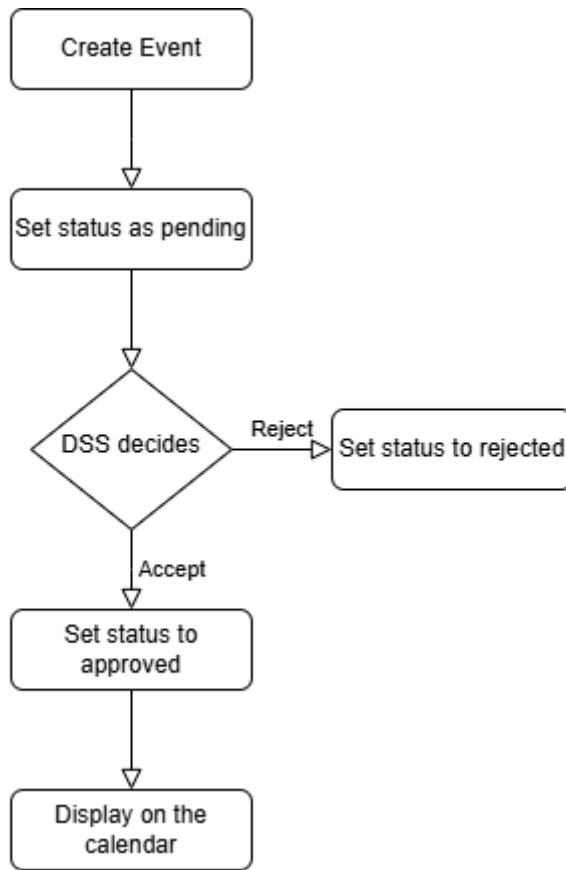


Fig 3. Creating an event

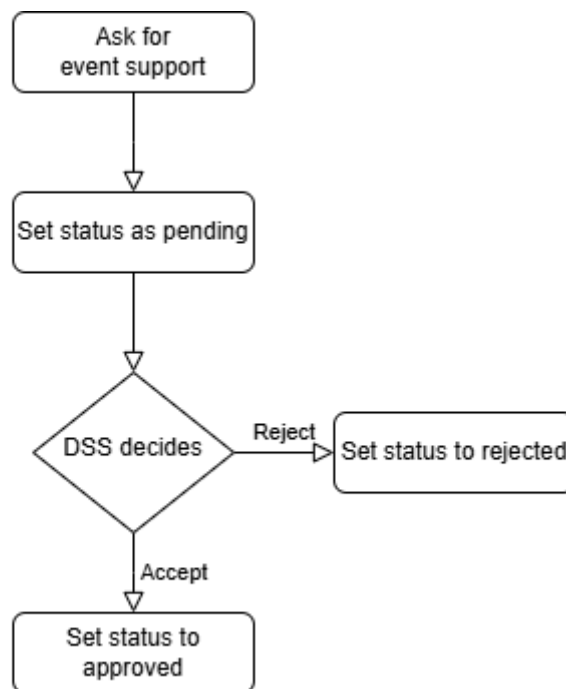


Fig 4. Creating an event support request

To support our development and testing we had used several tools. We used Postman to simulate HTTP requests to test out API endpoints, verify input formats and responses. Overall - to ensure proper communication between frontend and backend. This was mainly used to test out our CRUD operations. We used DBeaver to interact with our database directly, inspect table schemas and monitor changes in real-time.

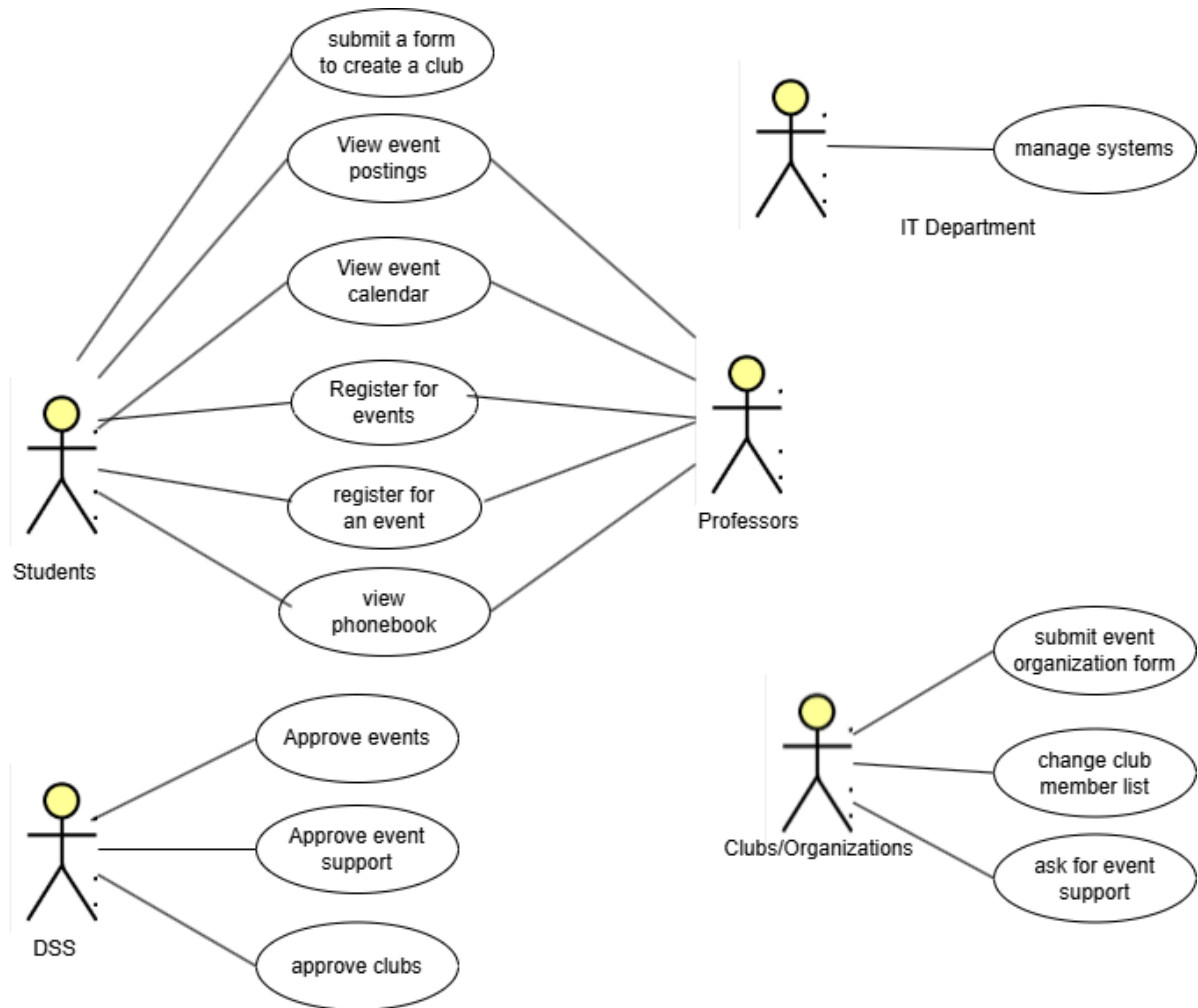


Fig 4. Use case diagram

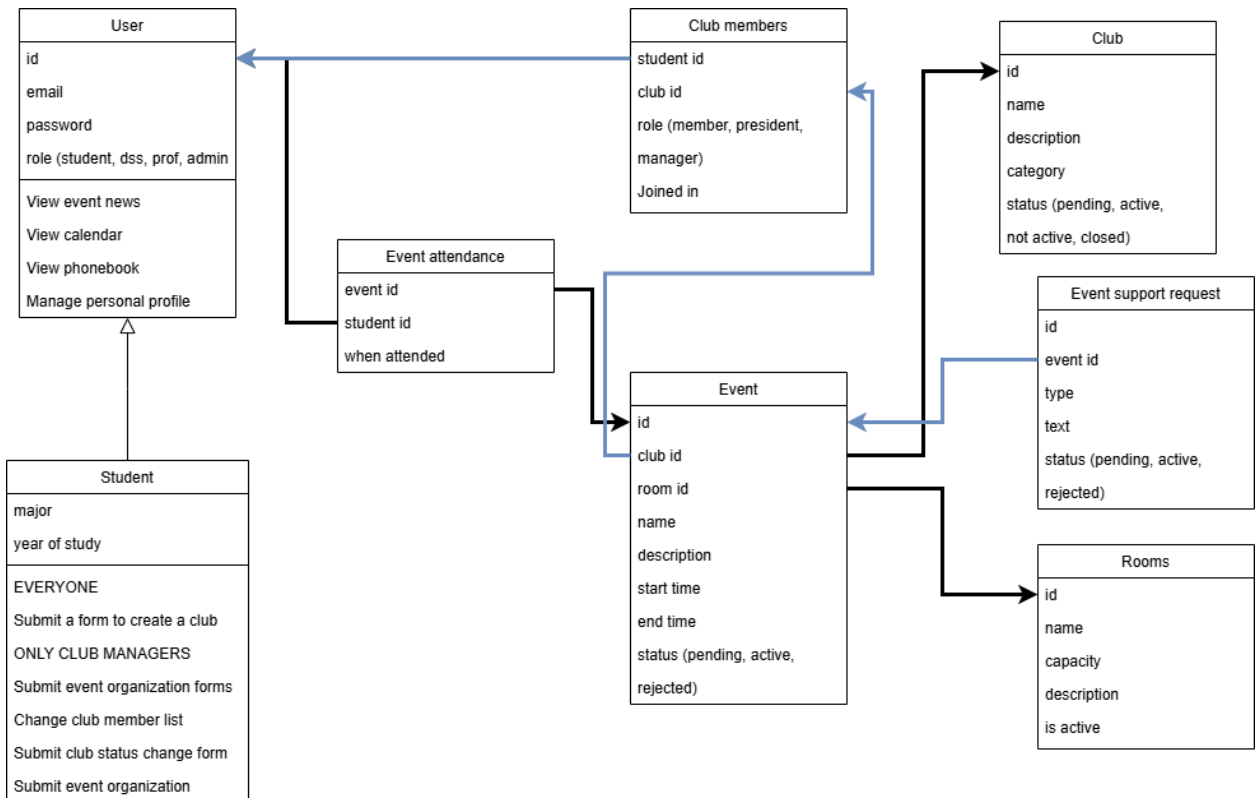


Fig 5. Class diagram

Our team has used a lot of third-party components to make sure our system is not only functional but scalable, maintainable and industry grade. Below is a breakdown of these components.

### 1. Frontend Framework and Core Libraries:

- React (v19) - Main frontend framework
- Inertia.js (@inertiajs/react) - Bridges Laravel backend with React frontend
- TypeScript - For static type checking
- Vite - Modern frontend build tool

### 2. UI Component Libraries:

#### a) Radix UI Components (@radix-ui/react-\*)

- Pre-built accessible components like:
  - Dialog
  - Dropdown Menu
  - Navigation Menu
  - Tabs
  - Select
  - Tooltip

- Avatar
  - Checkbox
- and more

### **3. Styling and Design:**

- TailwindCSS (v4) - Utility-first CSS framework
- tailwind-merge - For merging Tailwind classes
- class-variance-authority - For creating variant components
- tailwindcss-animate - Animation utilities

### **4. Additional Frontend Utilities:**

- date-fns - Date manipulation library
- framer-motion - Animation library
- sonner - Toast notifications
- xlsx - Excel file handling
- i18next - Internationalization

### **5. Development Tools:**

- ESLint - Code linting
- Prettier - Code formatting

### **6. Backend (Laravel) Packages:**

- laravel/framework (v12) - Main PHP framework
- laravel/socialite - Social authentication
- darkaonline/l5-swagger - API documentation
- laravel/tinker - REPL for Laravel

### **7. Testing Tools:**

- pestphp/pest - PHP testing framework

Our team used several project management tools to effectively develop computing-based solution.

- Daily meetings helped us manage our time and track each team member's progress. We had online meetings for about 10-15 minutes three times per week through Google Meet. To schedule meetings, we used the <https://www.when2meet.com/> website and easily found convenient available hours for everyone.

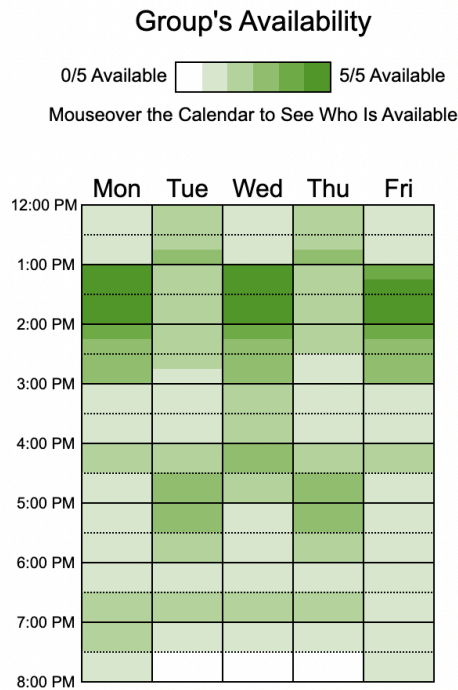


Fig 6. Schedule of daily meetings

- Setting long-term goals through the Gantt Chart was helpful to see whether we were not falling behind the plan and correctly following the instructions.
- To track daily and weekly tasks, we used the Trello (<https://trello.com/>) website. The Kanban system is useful for listing to-do, in-progress, and completed tasks and assigning new tasks to team members.

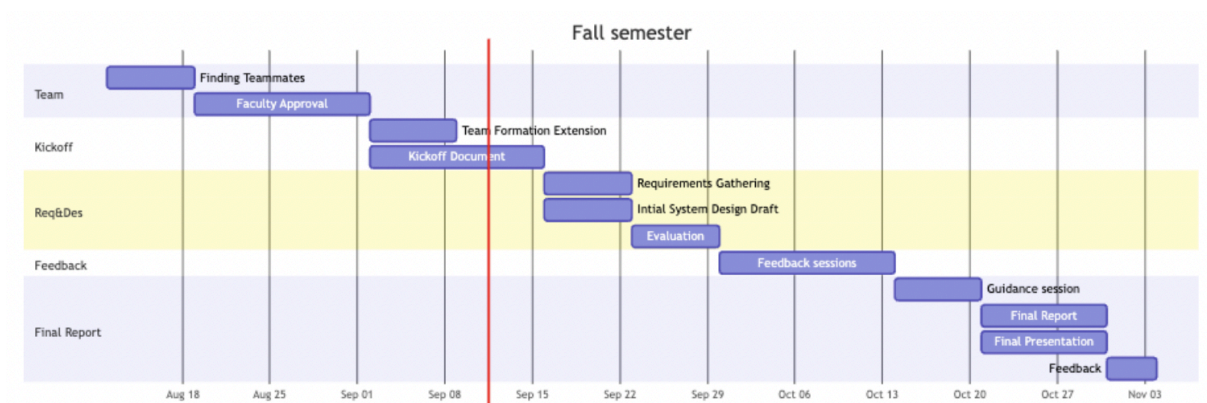


Fig 7. Fall semester Gantt Chart

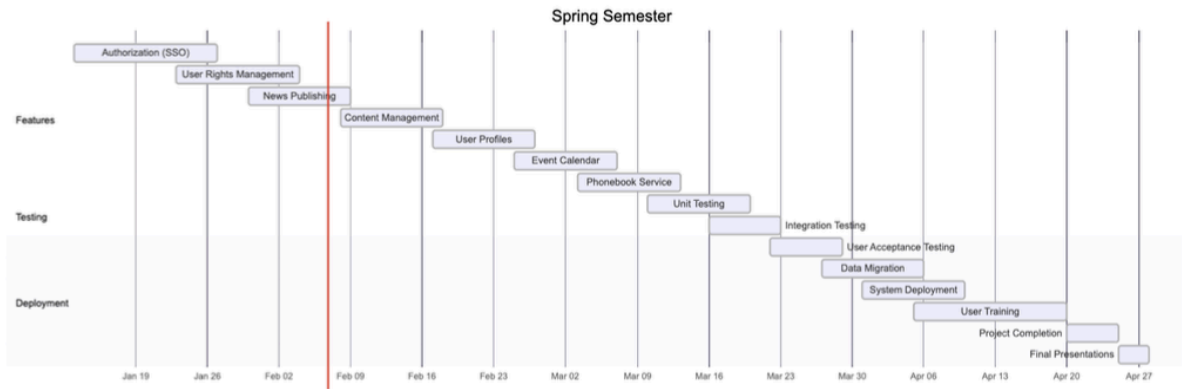


Fig 8. Spring semester Gantt Chart

## 5. Project Execution

- Describe what happened over the course of the last two semesters

Our team has developed a full-stack application. The backend we did in PHP using the Laravel framework. We have used React for frontend, Vite for building and TypeScript for coding. We designed the interface in accordance with the Nazarbayev University's branding requirements. You can see the interface below.

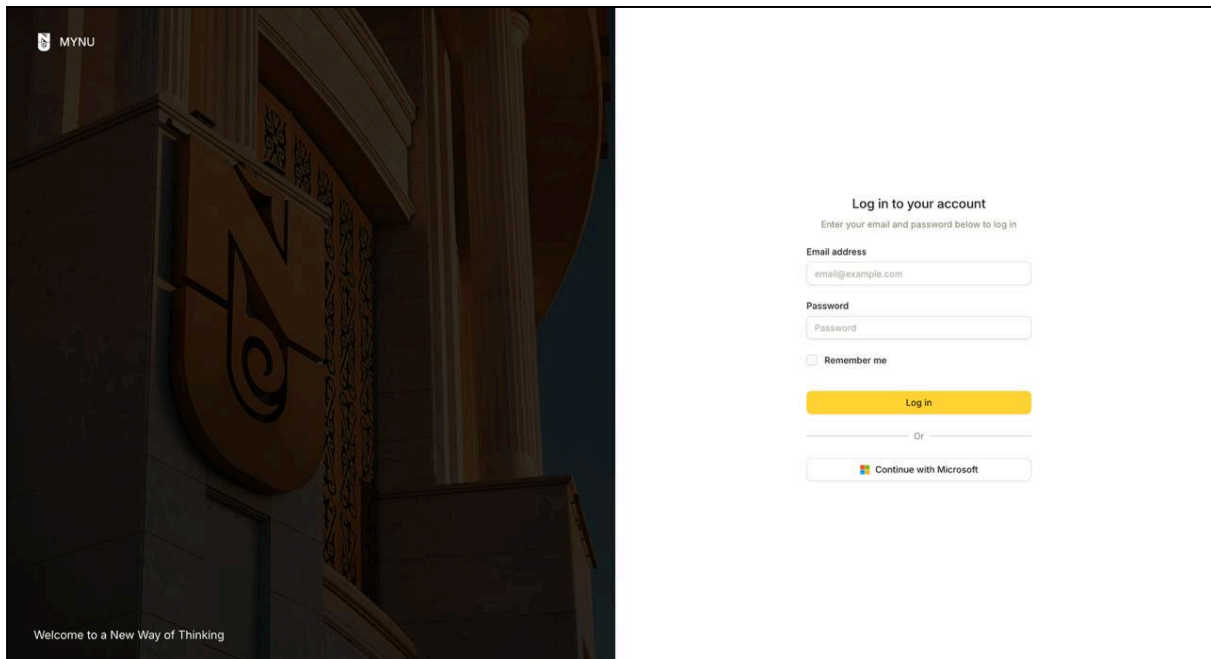


Fig 9. Login page, desktop view

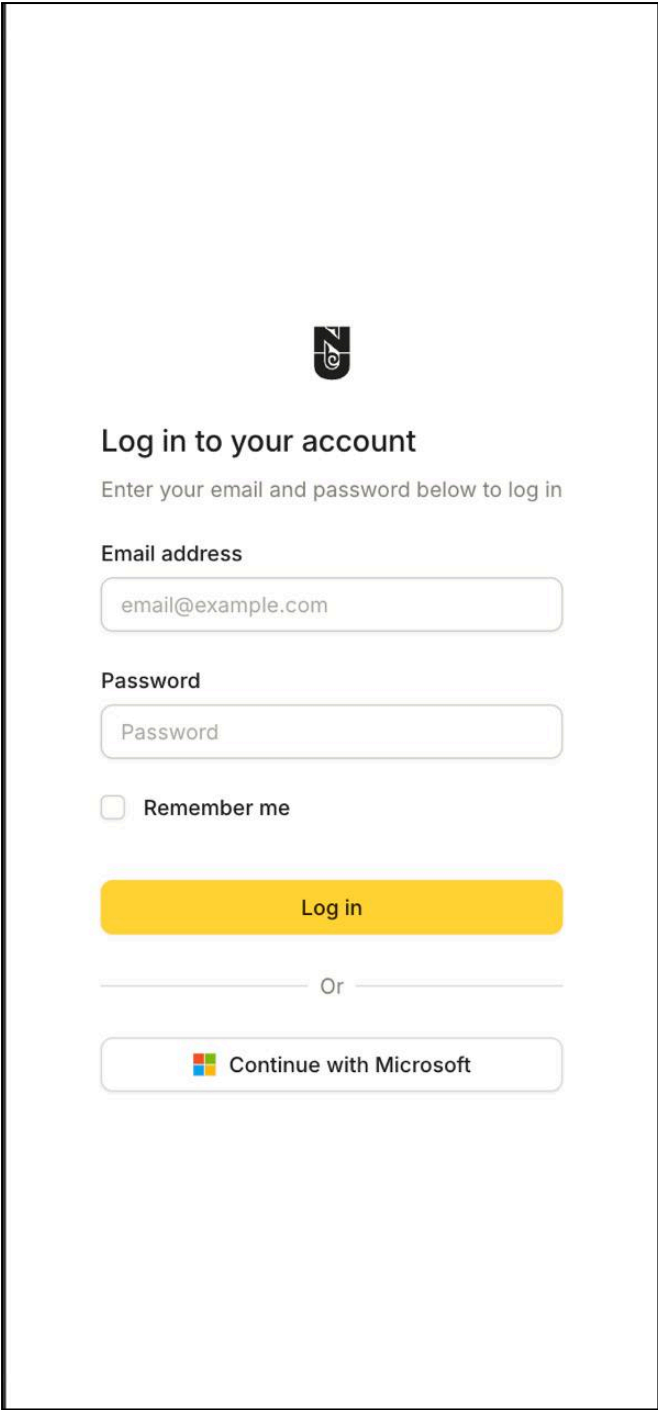


Fig 10. Login page, phone view

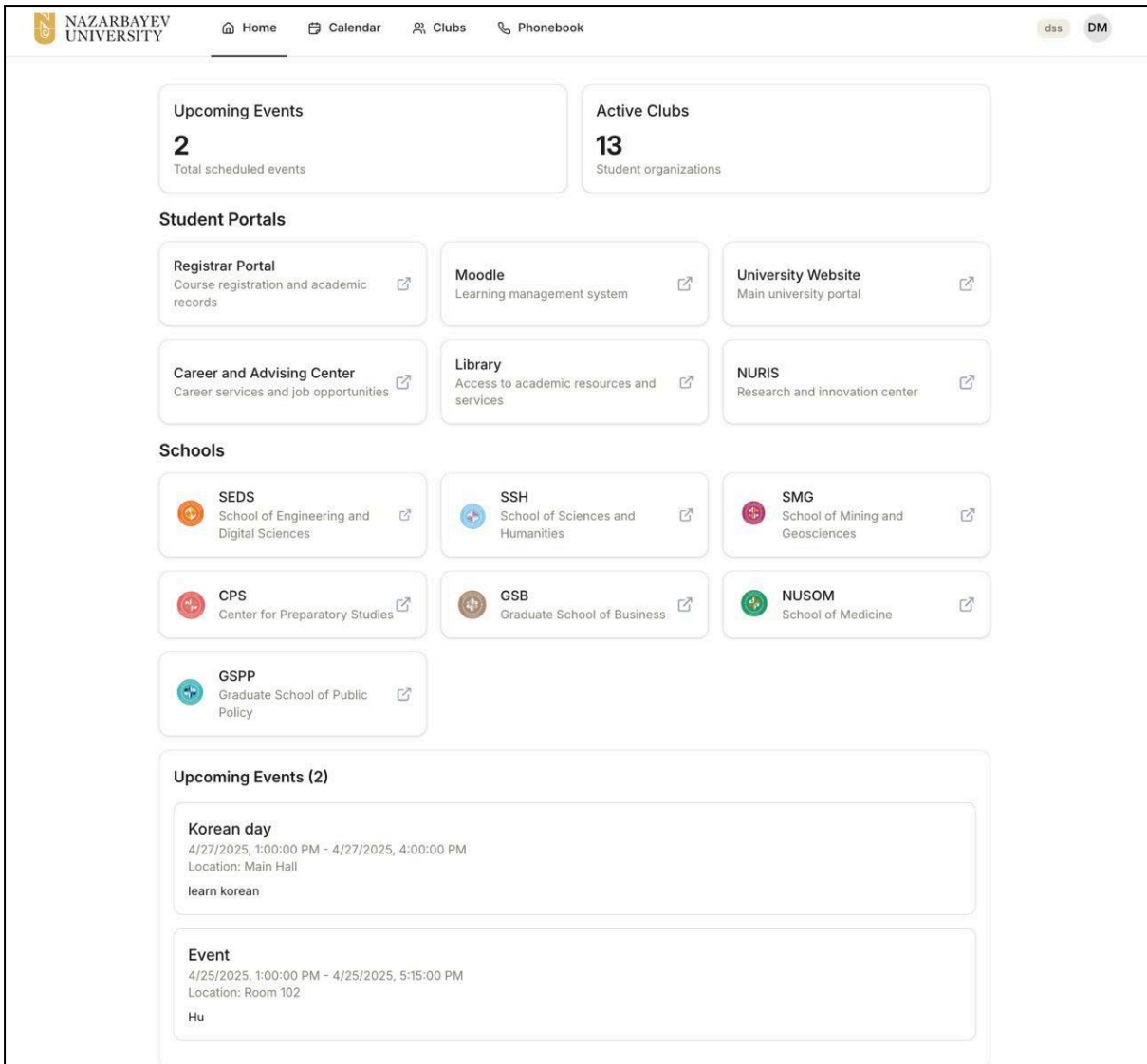


Fig 11. The “Home” page of our system, DSS view

NAZARBAYEV UNIVERSITY Home Calendar Clubs Phonebook dss DM

Today < > April 2025 Month + New event Pending events

Sun	Mon	Tue	Wed	Thu	Fri	Sat
30	31	1	2	3	4	5
6	7	8	9	10 2pm Speech	11	12
13 2pm Event	14	15	16	17	18	19
20	21	22	23	24	25 3pm Event 1:15pm Event	26
27 1pm Korean day	28 1pm Talk	29	30	1 1pm Speech	2 2pm Japanese Day	3

Fig 12. Calendar

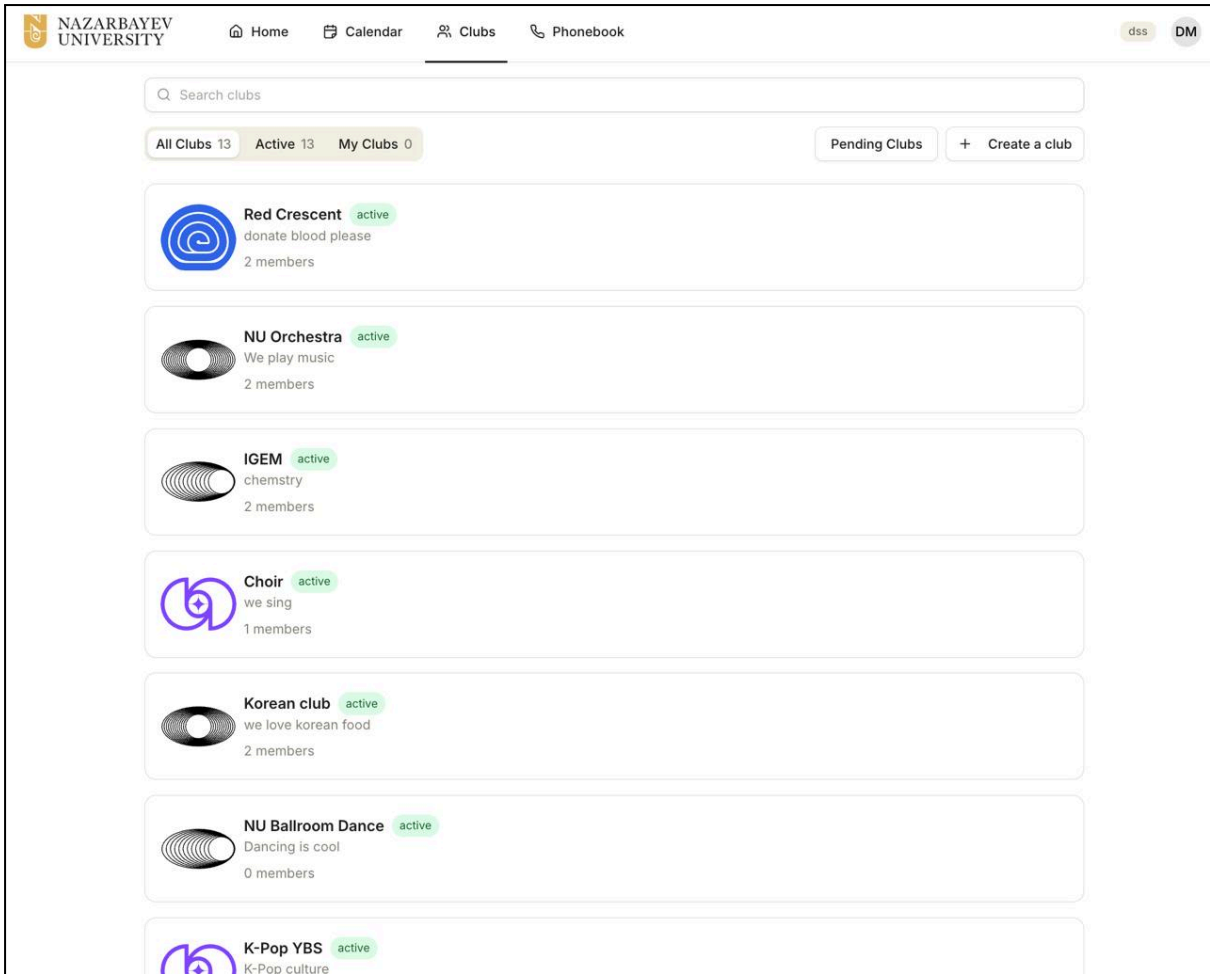


Fig 13. Clubs page

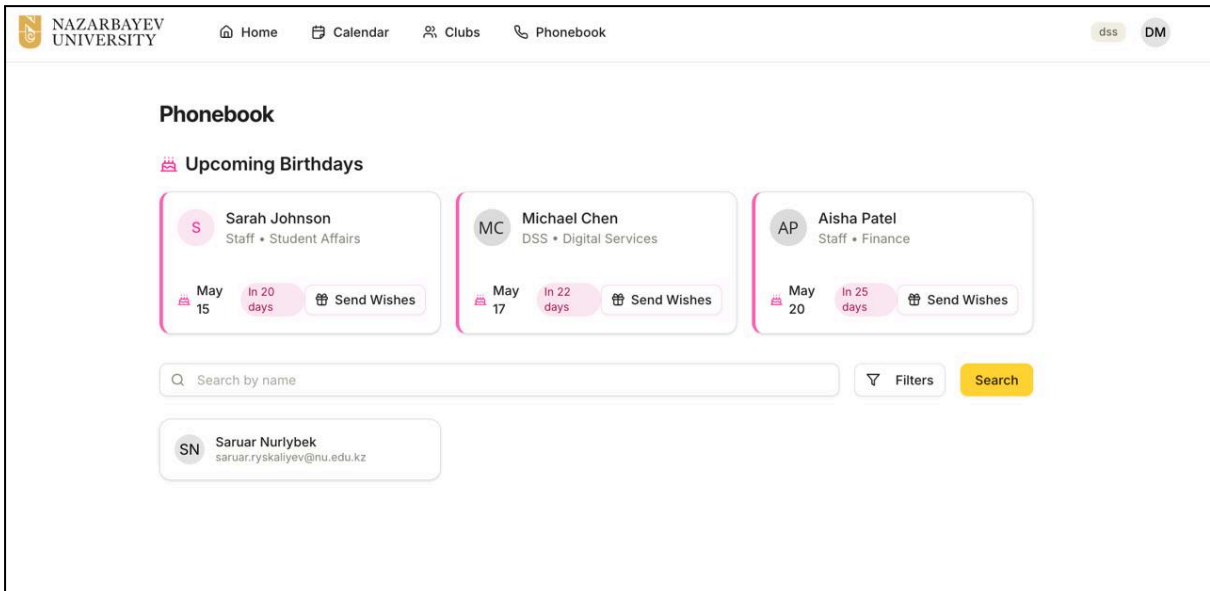


Fig 14. Phonebook

We have managed to build a scalable, maintainable and user-friendly system. With features like role management, event approvals, request workflows and support requests to streamline operations and improve coordination between students and university  
There were some design choices that we later scrapped:

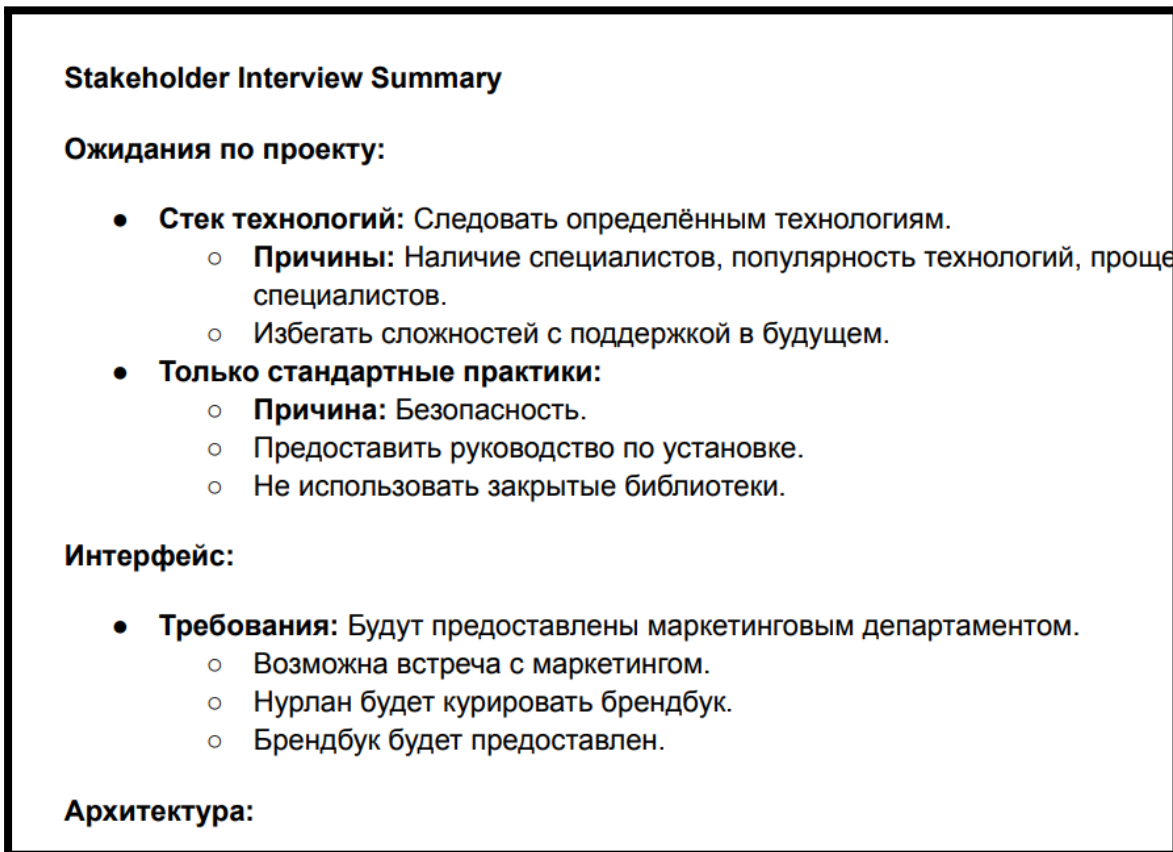


Fig 15. An excerpt from stakeholder interview summary

There were some features that we decided to scrap. Initially we planned to have a linked.in like post system and a “For You” page. The idea was that students and especially clubs could make posts. Clubs could make posts about their events and students would see these posts. Ultimately we decided against creating a full linked.in like system and instead make an equivalent of “For You” page, but only for the approved events. The information of the events will be displayed on the front user page akin to social media posts, this way we implemented the important thing (event information) without bloating our system with non requested social media systems.

There were also, however, some features that we ultimately couldn’t implement in the project.

We did, however, face some challenges while implementing the solution.

#### 1. Integration with 1C

Task: We were asked to connect a 1C database to an existing PostgreSQL database and establish data transfers between the two.

Challenges: Working with two different Database Management Systems simultaneously turned out to be really difficult because of the differences in protocols, formats and transaction mechanisms.

Result: We decided that supporting two databases would be excessive when we could simply store and process all the data in one PostgreSQL database. So we decided not to integrate 1C.

## 2. QR code-based attendance tracking

Task: We planned on generating unique QR codes for every event and track the QR codes at events' entrances

Challenges: Generating and managing all the unique qr codes was too challenging and time consuming. Connecting the QR codes to the students in real time was troublesome. The system was prone to errors in scanning and synchronizing.

Result: Decided not to implement QR codes and left event attendance in out of the system's scope.

Teamwork aspects.

Responsibilities were divided as shown below:

- Backend Team: Azat Utessov, Aruzhan Nurmanova, Adil Taibassarov.
- Frontend Team: Aldiyar Serikov, Saruar Ryskaliyev.

Leadership roles taken during the project are evenly distributed and each team member has shown equal responsibility. Our team used collaborative problem-solving strategies such as online daily meetings, brainstorming offline meetings, Kanban table and Gantt chart to track the progress of the project.

## 6. Evaluation

To evaluate our project solution and how effectively it deals with the problems mentioned before, we have conducted a requirement-based validation with one of our main stakeholders - the DSS. During the design phase of our project we had talked with the DSS about the project's list of requirements and have designed our system to adhere to said requirements. After finishing the development of our system, we took a systematic look at the requirements and the implemented features to determine how close we were able to follow the requirements. The table below shows the results.

No	Function name	Status
1	Booking venues (rooms/halls) for events	Implemented
2	Submit an event support request	Implemented

3	Submit an event approval request	Implemented
4	Event calendar	Implemented
5	Filter events on the calendar	Implemented
6	Booking a seat for an event and attendance tracking	Not Implemented
7	Exporting the calendar	Implemented
8	Reports from clubs about their events	Not implemented
9	A list of student clubs and opening new clubs	Implemented
10	Club's status	Implemented
11	Filtering by clubs	Implemented
12	Club membership	Implemented

This table clearly shows that our team has met 10 out of 12 functional needs defined by the DSS. Although we did not implement one single feature due to time constraints, all the administrative, organizational and calendar functions were delivered and are operational.

#	Наименование функциональности	Описание функциональности
1	Бронирование помещений на мероприятия	Выставление брони на проведение студенческих мероприятий в помещениях с возможностью видеть текущую занятость помещения
2	Подача заявки на материально-техническую поддержку мероприятия	Заявка на материально-техническую поддержку мероприятия подается внутри одной заявки на бронирование помещения. При просмотре имеющейся брони в системе должны быть видны все запросы, связанные с
3	Доступ клубам на отправку заявок для организации мероприятий	Студенческие клубы должны иметь доступ для заполнения заявок на бронирование помещений и материально-техническое обеспечение мероприятий. Доступ дается на основе корпоративной клубной почты. DSS проверяет заполненные заявки и ставит approve в системе для мероприятий, которые одобрены для исполнения. После согласования DSS в системе появляется бронь на мероприятие, в которой содержится вся информация о запросах студентов.

Fig 16. Stakeholder requirements

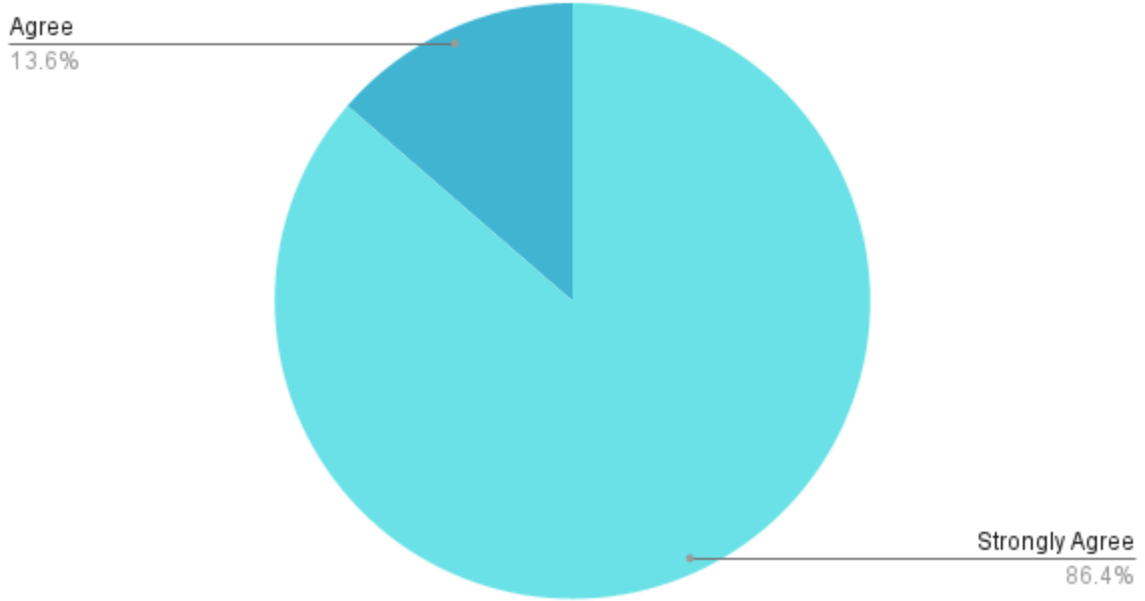
The system we developed can be very useful to the community of the Nazarbayev University and will no doubt make the lives of both students and staff much easier. When it comes to

organizing events, clubs, managing timetables and viewing important information - our system makes everything much easier and much quicker than before. Below are some of the possible use cases compared to how things were done before

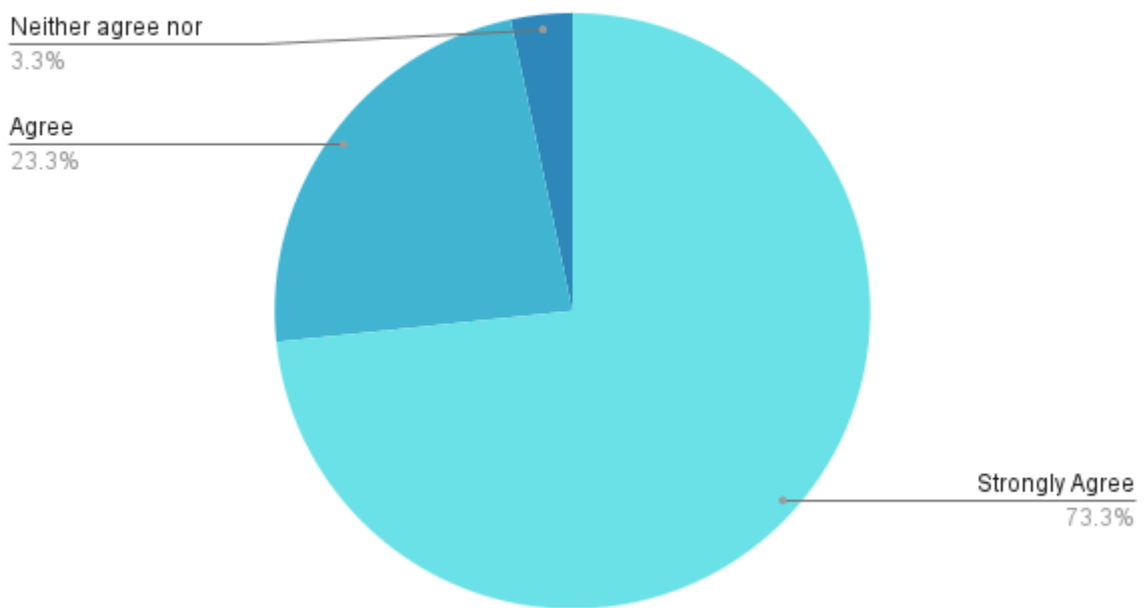
	Without system	With system
Booking venues for events	Club members had to communicate with other clubs to find out if the hall/room is free or to find out what halls/rooms are free	Our database keeps track of when rooms/halls are free/taken and clubs can just input the room when filling up the event form
Club membership management	Clubs had to collect data of every member every semester and DSS had to manually update it. Updates are only done once per semester	Clubs can update the member list themselves whenever they want
Starting a new club	Students had to go to DSS and convince them in person about their club	Students can fill up a form about creating a club and DSS will view it
Event attendance tracking	Clubs have to manually track every person who walks onto an event and get their student ID	Clubs only need to print a QR code and put it near the entrance.

We have shown the system to our fellow students to check the usability. For the sake of testing they could see not only the students' view, but also that of the DSS and IT department. 30 people had answered 6 questions with answers “Strongly Agree”, “Agree”, “Neither Agree nor Disagree”, “Disagree” and “Strongly Disagree”. The results and average scores (with 5 as “Strongly Agree” and 1 as “Strongly Disagree”) are as follows:

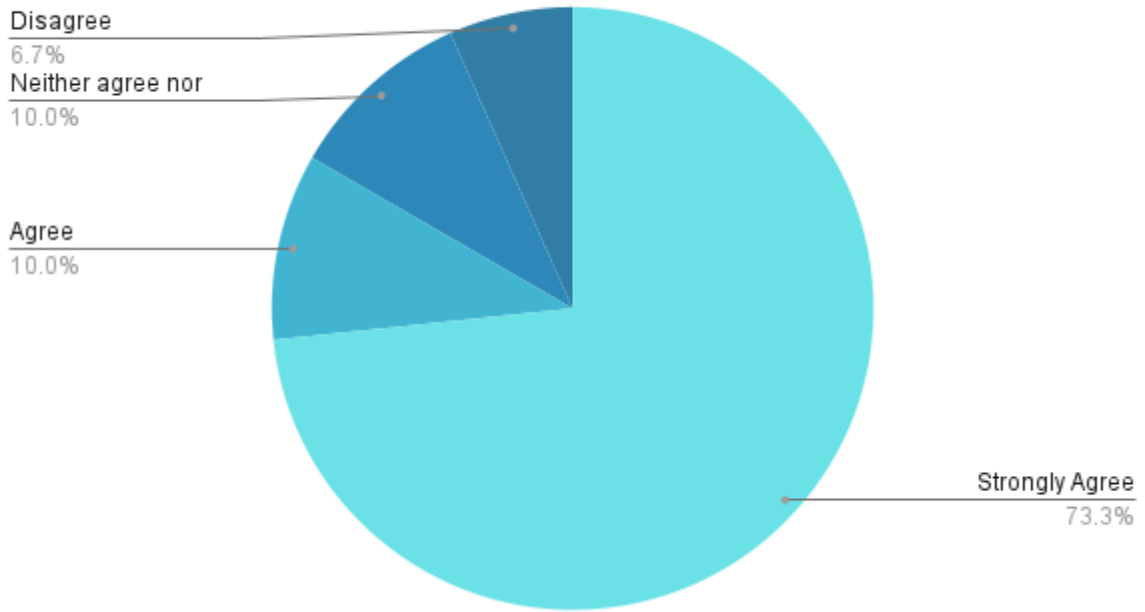
1. The portal is easy to use and navigate - Average score 4.6



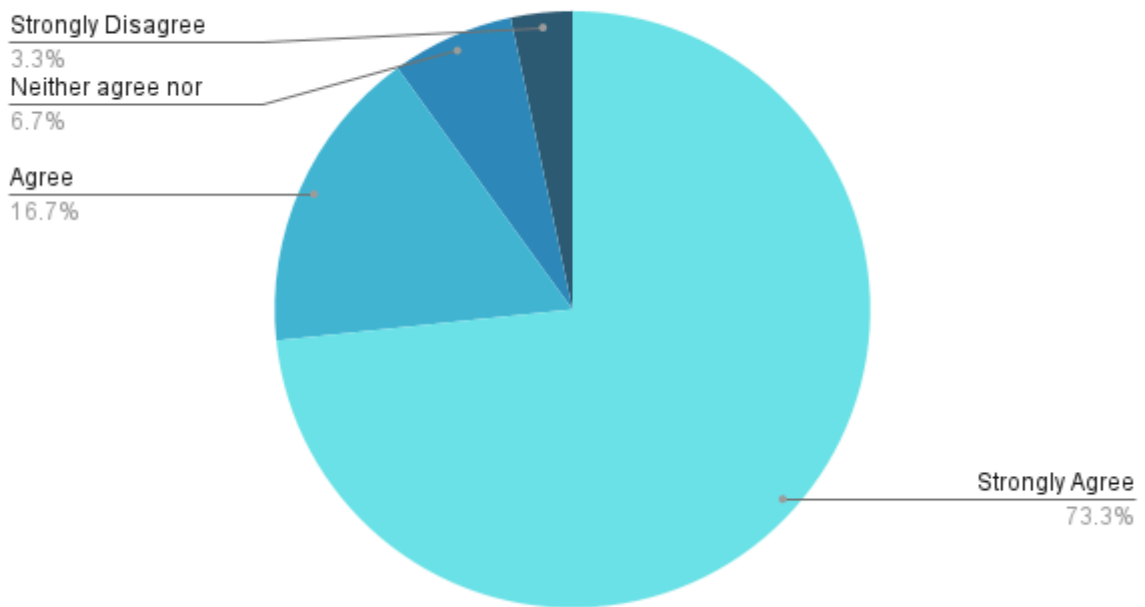
2. The event submission and approval process is intuitive - Average score 4.6



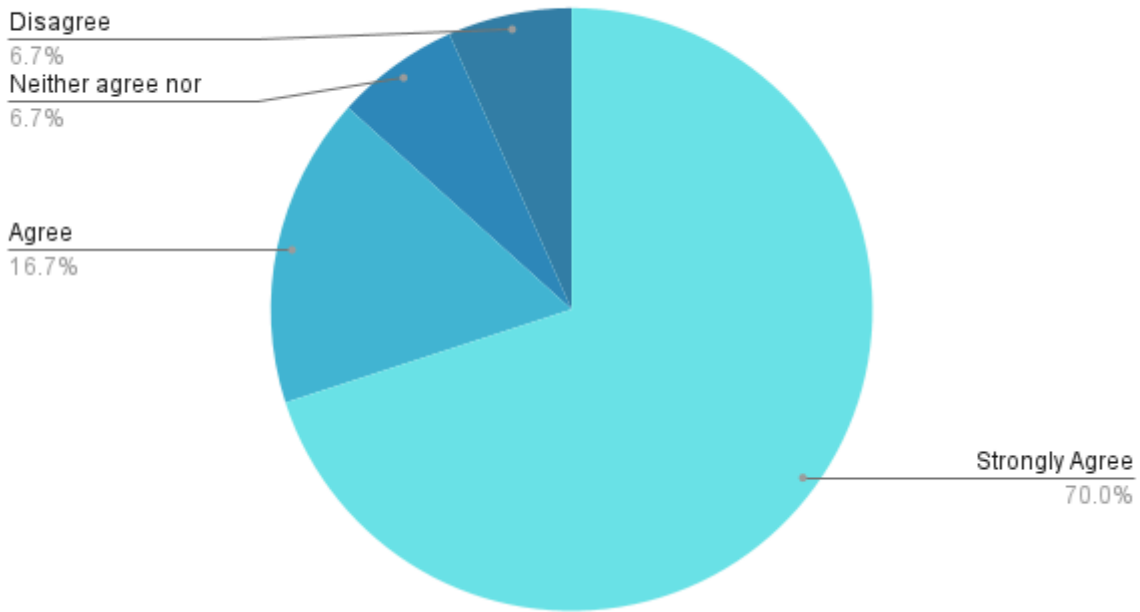
3. Support request creation is straightforward and useful - Average score 4.5



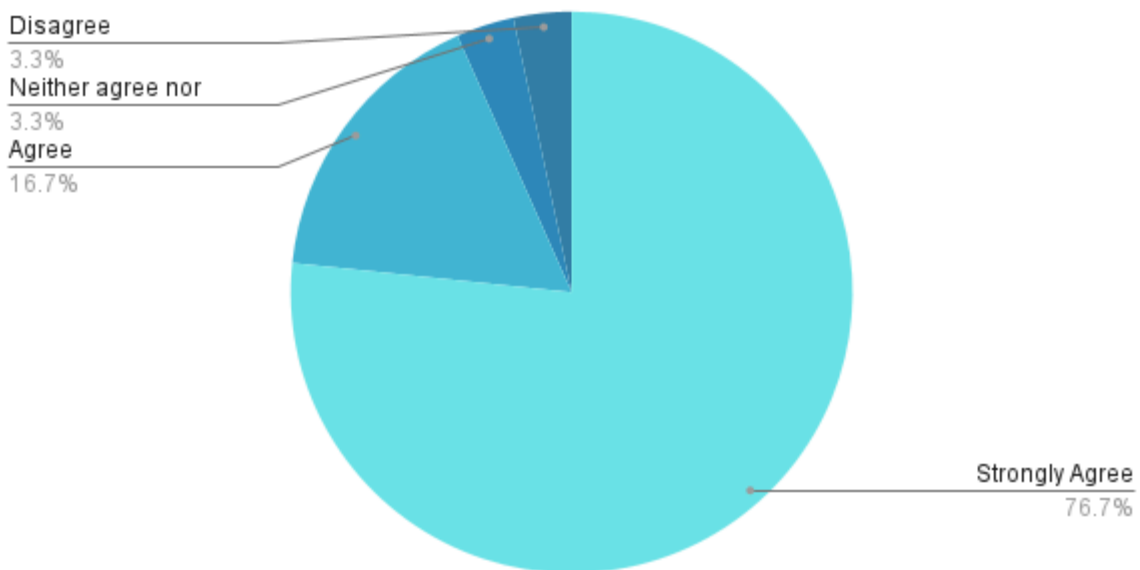
4. I would prefer this system over using emails for everything - Average score 4.5



5. I feel confident using this system without external help - Average score 4.5



6. The design and layout of the portal are clear and visually appealing - Average score 4.6



## 7. Conclusion and possible future work

In conclusion, we designed one integrated, all-inclusive web-based corporate portal that solves Nazarbayev University's inconsistencies in deactivated portals and misaligned information. The system in place helps manage clubs, events, and daily scheduling efforts and information more easily. With 10 out of 12 features fully intended and deployed within the portal, it increases access and facilitates communication among students, faculty, support staff, and the Department of Student Services (DSS). The features that matter most operate

behind the scenes, booking venues and registering for memberships and attendance daily. These are the features now can be done effortlessly as opposed to previously.

As for the features to be implemented in the future, one is the option for clubs to submit reports for their events and add attendance tracking feature. Other changes include a different appearance for the portal based on information obtained from surveys and suggestions from students and staff. Usability test sessions will give a better overview of what students and staff want for the interface, which may also need adjustments to the interface and functionality.

Ultimately, the changes to be made in a future version rely on thorough testing, however. Security testing needs to be done regularly after any new implementation to see how the web portal can be hacked. In addition, performance testing needs to see how the web portal functions with 1,000+ users at once to ensure effective usage on a larger scale. Implementing these changes will allow the web portal to work for university members over time and keep it functioning with purpose and functionality.

## **8. References**

Jones, P., Harris, R., & Thompson, G. (2020). Best practices for corporate intranets: Lessons from enterprise environments. *Intranet Systems Journal*, 38(1), 47-59.

Patel, R., & Jones, S. (2021). Brand compliance and user engagement in enterprise intranets. *Journal of Corporate Branding*, 13(3), 120-135.

Roshni, P., & Yadav, S. (2020). Centralized platforms for academic institutions: A study on integration and communication. *Higher Education Systems Review*, 24(4), 67-81.

Trello, Inc. (n.d.). *Trello: Capture, organize, and tackle your to-dos from anywhere*. Trello. <https://trello.com/>

When2meet. (n.d.). *When2meet*. Retrieved April 25, 2025, from <https://www.when2meet.com/>