

NU Corporate Web-Portal

Senior Project Report

Group Members:

Assiya Yeraly

Aiganym Shynarbek

Adilzhan Serikzhanov

Alibek Ubaidullayev

Aktan Seraliyev

Advisers:

Askar Boranbayev, Almas Amirbekov

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Executive Summary

This project focuses on building, both technically and stylistically, the Corporate Portal for Nazarbayev University. One of the main reasons why such a project was needed is the maintainability issues and lack of modern approaches in the legacy code for `my.nu.edu.kz`

Our main objective was to design and develop the NU Corporate Web Portal, a platform for information and content sharing among Nazarbayev University students, staff, and professors. The features that the portal includes are dynamic news and content publishing, a comprehensive and flexible calendar, a phonebook, dashboards, and a role-based resources access system.

An Agile-based approach was established and applied during the full academic year. Careful planning and communication between team members—Assiya Yeraly, Aktan Seraliyev, Aiganym Shynarbek, Adilzhan Serikzhanov, and Alibek Ubaidullayev—allowed us to effectively separate tasks and responsibilities to achieve the best-quality product that was achievable. The team was separated into two groups: frontend and backend. The focused and isolated workflow, with constant exchange of information between teams, resulted in an effective approach to building the project.

The main challenges during the project development were the lack of experience working in Java Spring and the complexity of integrating Microsoft Azure. However, both problems forced us to make better decisions during development: we used annotation-based coding in Spring that significantly reduced the amount of code and made the codebase more predictable and maintainable, and we integrated Azure Blob for saving files in the cloud, which allowed us to have smaller servers in case of hard memory.

This project successfully demonstrates the design, implementation, and evaluation of a computing-based solution that is scalable, maintainable, and tailored to the needs of a real academic environment.

CHAPTER 1

Introduction

1.1 Problem Description and Motivation

The current web portal my.nu.edu.kz has not been updated for several years. In this regard, it became more and more difficult to deal with the support of the platform. This prevented the IT team from integrating new technologies and approaches. This resulted in a platform that could not keep up with modern trends in education technology.

Building on this pressing need, our team was motivated by the opportunity to make a meaningful and lasting contribution to our university community. As students who regularly use the my.nu.edu.kz platform, we were faced with User Interface and User Experience limitations in the existing interface. We believe that a modern, well-structured and robust platform could greatly improve the daily routine of students, faculty and staff.

This project is our desire to honor the institution that has shaped our academic and personal growth over the past four years.

1.2 Significance of the project

This project is of great importance to the students as well as to the administrative and IT departments of the university. This platform will facilitate interaction and strengthen the bonds between members of the university community. It will be easier for the student affairs department to publish important news, and the marketing department will be able to proudly showcase our platform as competitive with other platforms. By designing and building a state-of-the-art platform, we are laying the foundation for a system that can be further developed and expanded by the university's IT department in the future.

1.3 Organization of the Report

The report is structured as follows:

Background and Related Work Context and review of existing solutions.

Project Approach Planning, requirements gathering, and design decisions.

Project Execution Implementation details, tools, and technologies.

Evaluation Prototype testing, performance metrics, and user feedback.

Conclusion and Future Work Summary of outcomes and proposed next steps.

References and Appendices Citations and supplementary materials.

CHAPTER 2

Background and Related Work

2.1 Prior Research and Related Work

The local corporate portals in universities are vital for communication between community members [2]. Therefore, maintaining and updating of such application have positive long-term effect on the organization itself. Also, it is important to such products with following the existing requirements of university. A key aspect of our design process was ensuring that the new platform would align with the university's both functional and non-functional requirements. Therefore, the existing system was carefully explored. While brandbook provided by university allowed us to fully adapt existing style of NU.

2.2 Existing Solution: my.nu.edu.kz

Present corporate portal for Nazarbayev University offers a satisfiable solution for its problematics. It has Azure SSO integration that allows users to login without registration, all required information and CAPTCHA to ensure safety. However, there are two major issues with current implementation: outdated front-end and legacy code backend. Therefore, combination of those factors resulted in my.nu.edu.kz to be extremely unflexible and accumulating technical debt. Which "adds to the friction from which software development endeavors suffer" [3].

2.3 Proposed Solution

Leveraging modern frameworks, we will build the NU Corporate Web Portal to replace my.nu.edu.kz. It offers dynamic content management, profiles, an event calendar. Also, a searchable phone book. Guided by the Brandbook and stakeholder feedback, it delivers decent, performant and secure product.

Project Approach

3.1 System Architecture

The overall system architecture comprises five principal components:

User

The primary stakeholder and end user of the application.

Front-end

Provides an intuitive interface, displays results and error messages, and ensures a seamless user experience.

Backend

Implements the core business logic and handles data processing.

Database

Manages persistent data storage and retrieval.

API exposes RESTful endpoints to facilitate communication between the front-end and back-end.

3.1.1 Backend Architecture

Initially, the backend was prototyped as a microservices architecture, offering high modularity and independent scalability. However, the added complexity of configuring and deploying message brokers conflicted with our maintainability goals. Consequently, the architecture was consolidated into a monolithic design.

We adopted a **RESTful API** (Representational State Transfer) for communication between the frontend and backend, benefiting from its scalability, performance, and support for multiple content types [1].

The backend follows a **three-tier** architecture pattern, dividing responsibilities into:

- *Presentation layer*
- *Business-logic layer*
- *Data-access layer*

This separation enhances maintainability, readability, and code reusability. Leveraging Spring Boot's annotation-driven configuration and built-in dependency injection further simplifies development and enforces best practices.

3.1.2 Frontend Architecture

The frontend is built with **Next.js**, a popular React-based framework.

We employ **Server-Side Rendering (SSR)** to pre-render pages on the server, improving performance and security by handling data fetching, validation, and authorization before delivering content to the client.

3.2 Core Features

The application provides the following key features:

- **Role-based Access Control:** Differentiates permissions for *Students*, *Staff*, and *Professors*.
- **Content Sharing:** Enables any authenticated user to publish and share content.
- **Profile Management:** Allows users to edit their profile information and configure visibility settings.
- **Dynamic Phonebook:** A searchable module for sharing and retrieving contact information.
- **NU Calendar:** Allows users to add, edit, and delete events for academic and community activities.

- **Birthday Widget:** Displays a list of users celebrating birthdays on the current day, fostering community engagement.

3.3 Workflow

3.3.1 Workflow Planning

The project workflow was designed around three core criteria: **accessibility**, **efficiency**, and **availability**. To maintain alignment and resolve technical issues promptly, the team held *biweekly* video calls via Telegram. The agile-method, especially its "focus on individual interaction" was adopted as main method of working in team [4].

Tools

Git & GitHub

Version control and collaborative development.

Figma

UI/UX prototyping and design.

FlowMapp

User-flow diagrams, wireframing, and task tracking.

Swagger

RESTful API documentation to streamline backend–frontend integration.

dbdiagram.io

Database schema modeling and management.

3.3.2 Team Responsibilities

Roles were assigned based on team members' expertise and interests, forming two focused subteams:

Frontend Team

- **Adilzhan Serikzhanov:** Frontend development, ensuring a responsive and feature-rich UI.
- **Aktan Seraliyev:** Frontend implementation and business analysis, alignment of functionality with user needs.

- **Aiganym Shynarbek:** Frontend integration, crafting the user interface experience.

3.3.3 Backend Team

- **Alibek Ubaidullayev:** Core backend logic, REST API endpoints, and database integration.
- **Assiya Yeraly:** Supported backend development, QA and team coordination.

CHAPTER 4

Project Execution

4.1 Project Journey Over Two Semesters

The final two semesters afford the design team the opportunity to learn, troubleshoot, and pivot, by starting our senior project from scratch. We started out with a really strong vision, stumbled upon some powerful design decisions, and crashed against some barricades—in some cases we managed to leap over them, in others we've left them as learnings. Our top priority was going to be a fullstack app, including a Java and Spring Boot backend of microservices along with a modern frontend in React and Next.js. The biggest challenge technically was that none of us had ever worked on the backend using Java and Spring Boot. As a result, much of the first phase was spent understanding the tools, frameworks and best practices. I felt like it was a nuisance at first, but eventually became a helpful tool and has encouraged us to write much cleaner backend code. We had tortured dreams of using Microsoft Azure's SSO for user authentication with early on, but punted given time and complexity. We chose to instead do some MVP and be as honest as we could about what we could actually build/demonstrate. It was a painful tough choice, but a priority to keep the project bariatonic on size and on the rails. We even reengineered our data model along the way as we built. Backend had an excessive number of models but we are aware that most of the models which had different names shared the same properties, were consisting of same functions again and again. We discovered were the best of after re-running and we used those number of models to combine similar models together. That was nice to DRY out the codebase, make it more maintainable and rid it of superfluous duplication. So on the frontend side, it was entirely more smooth sailing as quite a few of us had some experience with react. Around that part (Figma designs to working UI component) we had a great workflow. What worked design-wise was our teamplay in general. With a few exceptions, naturally we are all on the same page just by dividing tasks up fairly accurately and sharing the same roadmap.

We iterated in front-end and back-end teams together then we assembled and tested things in as few places as we could to make things go well. And ultimately they were developmental semesters. Nothing went as planned. Everything was the way we were intending we just had to scaledown and work together.” So we ended up with something we could use, something that works. Beyond learning graciously programming techniques the work side was the team work in an actual product.

4.2 Teamwork and Collaboration

Our team consisted of 5 members: Assiya Yeraly, Aktan Seraliyev, Aiganym Shynarbek, Adilzhan Serikzhanov, and Alibek Ubaidullayev. We went as far as to encourage the definition of responsibilities and the leveraging of our strengths from the get go, to be the most efficient and cohesive team possible. We’re split into 2 main teams: the backend team (Assiya and Alibek) and the frontend team (Aktan, Aiganym and Adilzhan). The whole point of this was to work concurrently and to speed up the writing. Alibek, who has had some commercial backends in Python altogether seems like a perfect guy to lead the backend. Although we were developing in Java, getup his backend architecture logic and database systems contributions were priceless. He was the front-end captain, also helped a lot with the complex logic and working with Assiya building the APIS and data layer. Adilzhan was the leader in the frontend. Being the ‘guru’ of hand-on frontend, he contributed a lot to structurizing the UI parts and helped us to move on and still belong to good coding manners and the same time make the frontend pretty matching the design. Assiya developed the system at the backend handled the system testing activity. She took all the unit, automated and performance tests, and we were able to know our app was well-tested in order to deploy it. Aiganym Shynarbek contributed to the development and designing of the user interface. She participated in making the designs alive and together with frontend team we were working on making our applications to have uniform and nice feel look. The intuitiveness for user and thoughtful design that she brings out of backgrounds in UX/UI was also a key contributor to the high quality polish of the final product.

CHAPTER 4. PROJECT PARTICIPANTS: The execution Aktan Seraliyev was contributing to the front end of the project and was a business analyst. He wireframed at the mid-high level, by translating the needs of users, the system requirements and balancing our approach on real user stories. His double-act was essential in ensuring my mind remained focused on the job. with dual emphasis on implementation and user focused design during development. We had a lot of development

decisions we made together in that direction. We were meeting on video calls on Telegram and brainstorming ideas, talking about what's next and coming up with solutions together. If anyone got stuck, the rest of us would dive in on calls and in-person meetings to brainstorm and solve the problem as a team. Our biweekly, face-to-face meetings were particularly key for hashing out the trickier issues and making sure all of our ducks were in a row, so to speak. We did okay as a team for this project in general. Every member all did their part as best they could and by each other's strengths we made a working game and better people in the process and had fun doing it. To measure if the problem presented in the introduction was solved properly, we utilized an effort image of user feedback and theirs feedback and a technical evaluation. NUs students and our team theTa we take it from students first a study survey we do which we as the TA. There are also questions of communication, event tracking, and university information access. And when we demoed the solution-demo for them, we asked, okay, should you use his tool, then how easy, clear, this featured, and for you, can it solve the daily problem? Accordingly, a large proportion of participants indicated that the proposed solution help to save time finding information concerning the campus so that our first goal is solved. Beside feedback from users, we went for very deep functional testing to make sure that all features did the job they were expected to do. This included testing registration login, posting content, phonebook, NYU calendar, and the birthday widget. Even the users admin, staff, student etc were having the correct access and these feature are for them only. Furthermore, for reused, mission-critical parts of the system, the automated tests were performed (mainly on backend) to make sure that features were still working properly after the implementation and the modification of a code. Finally, performaces tests were also realized to measure how the system behaves in different scenarios (e.g. with a high number of user). These tests proved us that the platform could, in fact, absorb usage volume in the real world, and it wouldn't lag or break. On the whole, mains multilayered evaluation process, continuous tracking and aggregating shape and form validation feedback with user validation appeared to work the issue as demoncontinuously strated by the operational success of the entire NU community.

Evaluation

5.1 Evaluation of the Project Solution

In order to make sure that our design solves the problem stated in the introduction, we conducted various types of evaluation analysis. We used user feedback methods, functional testing, and technical evaluation.

The first thing we did was to conduct a survey among our university students who are part of our target audience. The survey consisted of questions about current issues related to communication, event tracking, and general access to university-related information. We presented them with a demo version of our solution and asked them to share their opinion on the usability, the understandability of all the platform features (calendar, phonbook, etc.) and whether the platform covers their daily needs. More than 90

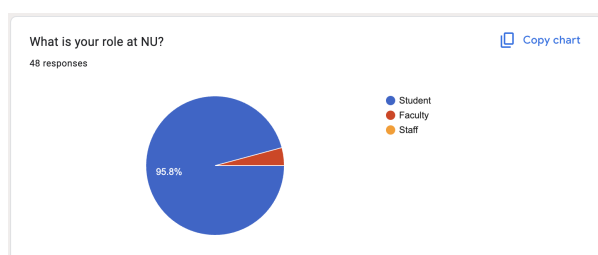


Figure 5.1.: This is a sample image

In addition to collecting user feedback, we conducted extensive functional testing to verify the functionality of each feature. We tested user registration and login, calendar for event management, content posting, phone book, and birthday widget. We verified that administrators, staff, and students with different roles had the appropriate access and could use the appropriate features.

In addition, we implemented automated testing of critical parts of the system. This was

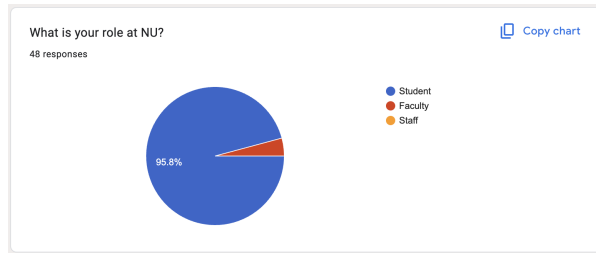


Figure 5.2.: This is a sample image

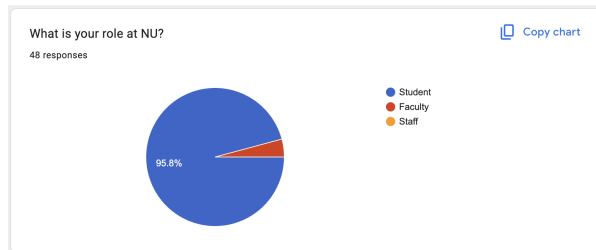


Figure 5.3.: This is a sample image

especially true for the backend to ensure that functionality remained unchanged after code updates.

Finally, we conducted performance measurement tests to evaluate how the system behaves under different conditions, such as high user activity. These tests helped us verify that the platform can run in a real-world context without lags or crashes.

Through this comprehensive evaluation process, we confirmed that our project effectively solves the problem and is a functional and reliable solution for the NU community.

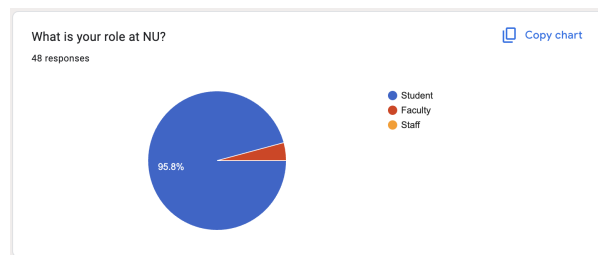


Figure 5.4.: This is a sample image

CHAPTER 6

Conclusion and Possible Future Work

Overall, the goal of this project was achieved: we have build modern, well-structured and decent web-application that provided all features as an existing `my.nu.edu.kz` with additional features. The main reason that created a demand in such project, maintainability and update problem, was fully covered and provided fresh view on an existing problem. The software development paradigms and tools adopted by our team allowed to efficiently overcome both technical and organizational problems that arose during the span of full academic year.

As for a future work, there are still some improvements that can expand our project. First of all, we can implement the mobile version of the web portal, so it would be easier for our users to switch between different devices. Moreover, we developed this project by prioritizing reusability. Therefore, it can be easily adopted by different educational institutions with minor changes in branding, authentication, and database configuration.

In conclusion, this project provided a new insight into solving the existing problem at Nazarbayev University and expanded our experience in developing real-world software solutions.

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APPENDIX A

Appendix

- Project Code Base

https://github.com/kkamona/nu_corporate_portal

-Google Form Survey for Users

[https://docs.google.com/forms/d/1HWszCfvIzGZXFlvx6b6QysQnQaSS8Tx-PhTjV9mnvmE/
edit](https://docs.google.com/forms/d/1HWszCfvIzGZXFlvx6b6QysQnQaSS8Tx-PhTjV9mnvmE/edit)