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Implementing Agile Method for Developing Nutritious School Lunch Program Web Application

Wisnu Uriawan [*], Ridwan Ahmad Fauzan [*], Siti Jahro Maulidiyah [*], Wildan Sophal Jamil [*], Reski Firmansyah [*], Teuku Muhammad Saif [*], Rd Imam Saepul Millah [*]

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Implementing Agile Method for Developing Nutritious School Lunch Program Web Application

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Abstract: The issue of sufficient nutrition and appropriate distribution in school lunch programs presents a significant challenge that must be addressed. Many schools struggle to provide food that meets all of their students' nutritional needs. Additionally, inconsistencies in nutritional information and administrative difficulties often hinder the efficient operation of these programs. Developing technology to better manage school lunch programs is critical to addressing these issues. The goal of this project is to create a web application that ensures the fair distribution of nutritional information while also increasing the efficiency of lunch program administration. The methodology used in this research is Agile. Agile approaches are employed throughout the development process, allowing for rapid iteration and responsiveness to user feedback. The end result is a web tool called Nourishify, designed to streamline the management and dissemination of nutritional information. Implementing Nourishify led to substantial improvements in access to nutrition information and operational efficiency, making it an innovative solution for school lunch programs. This project demonstrates that integrating technology can significantly enhance the administration and transparency of nutrition programs, ultimately benefiting students' health and well-being. Moreover, Nourishify's user-friendly interface and real-time data capabilities ensure that all stakeholders, including parents, administrators, and nutritionists, can easily collaborate and access crucial information.

Keywords: agile method; nutritious; school lunch; web; application

1. Introduction

In the current digital age, incorporating technology into public services is more vital for improving efficiency and accessibility. Among these vital public programs is the school lunch program, which is aimed to offer nutritional meals to pupils, particularly those from economically disadvantaged homes, in order to improve their health and academic performance.

Several countries, notably the United States, have successfully established school lunch programs with beneficial outcomes. The program not only meets children' dietary needs, but also improves their academic performance and overall well-being. Although school lunch programs are less popular in Indonesia than in other countries, there is a growing awareness of the need for similar services. However, significant hurdles remain, including student data management, efficient food distribution, and effective beneficiary monitoring.

The effect of nutritious lunches on education in Indonesia is a topic that illustrates the importance of adequate nutrition for children's development in an educational setting. Free school lunch programs have been shown to have a significant positive impact on students' attendance, learning concentration and academic performance. By providing healthy and nutritious meals on a regular basis, the program helps to ensure that children have enough energy to learn optimally.

Recent studies, such as the one conducted by t Rahma Nida and Dwi Darma Puspita Sari (2023), highlight that school feeding programs in Indonesia, have a positive impact on improving educational outcomes. This research shows that children who receive school lunches tend to perform better academically, as adequate nutrition supports their cognitive function and learning ability.[1]

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In addition, better school attendance is also a result of the lunch program, as children who receive adequate nutrition tend to be healthier and less absent. This not only improves the quality of education on an individual basis, but can also contribute to an overall increase in school productivity.

However, challenges faced in the implementation of this program include the availability and sustainability of funds, as well as the efficient management of logistics to provide meals that meet nutritional standards. Good coordination between the government, schools and local communities is also crucial to ensure the long-term success of the nutritious lunch program in Indonesia.

Overall, investing in nutritious school lunch programs not only impacts children's health and education, but is also a strategic step in building a strong foundation for the nation's future. By ensuring that every child is adequately nourished from an early age, Indonesia can prepare a healthier, smarter generation that is ready to compete in the era of globalization.

The development of a nutritious school lunch program web application addresses the significant issue of ensuring the availability of healthy food options for students. This problem is multi-faceted, involving needs, food preferences and logistical considerations for providing balanced meals in a school environment. Applying an agile methodology to this development process allowed for a flexible and iterative approach, which was critical to adapting to the dynamic needs and feedback of the end users, including students, parents and school staff.

The requirement for free lunch services among school pupils presents obstacles in efficient and targeted program management. Simultaneously, the demand for more comprehensive monitoring of meal distribution to low-income pupils has grown. Economic swings, the amount of economic uncertainty, and the impact of the global pandemic have all impacted the community's social and economic status, particularly its ability to meet food needs.

Schools are more than just educational institutions; they are also social institutions that care about their pupils' general well-being. The free lunch program not only meets students' physical needs, but also provides the necessary assistance for students to do better in school. School lunch is an attempt to guarantee that pupils' physical health complements their learning process optimally.

Free school lunch programs play as a fundamental role in addressing students' physical needs and contributing to their cognitive development and academic success. However, managing these programs effectively poses significant challenges, including accurate distribution and maintaining effective oversight and accessibility. Nourishify addresses these challenges through a technology-driven approach that simplifies and enhances the management of school lunch programs. By leveraging digital tools, Nourishify offers a comprehensive solution for schools to streamline their meal distribution processes, making it easier for students to receive the food they need.

he need for Nourishify has become increasingly pressing in light of economic fluctuations, uncertainty, and the long-lasting impacts of global events like the pandemic. These challenges have highlighted the importance of efficient and equitable management of free school meal programs. Schools, as key community hubs, provide crucial support beyond education, ensuring that students receive the nutrition they need to thrive both physically and academically.

Upon registration, students receive a Nourishify account, which provides them with a QR card or ID that can be used to claim their meals. This system allows for quick verification and ensures that only eligible students receive their allotted meals. Each student's account displays their profile, balance of meal credits (referred to as "coins"), and detailed information about their entitlements. Parents can also request additional meal credits, ensuring that their children have enough to cover their nutritional needs.

For administrators, Nourishify offers a dedicated interface to manage the daily operations of the meal program. By scanning QR codes or entering student IDs, administrators can efficiently track and verify meal distributions, ensuring compliance and reducing the potential for errors or misuse.

The primary goal of Nourishify is to ensure that every eligible student receives adequate nutrition through a well-managed school lunch program. By enhancing data management and meal distribution, Nourishify facilitates accurate monitoring and responsive support for students' nutritional needs. This

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approach not only improves the efficiency of the program but also supports students' overall academic and personal development.

Moreover, Nourishify aims to provide equitable access to information about the free lunch program, making it easy for families to understand how to access and benefit from these services. The platform's user-friendly design enhances administrative efficiency, allowing schools and governments to deliver better services to their communities.

2. Related Work

This paper proposes a credit scoring method based on FICO score and FIVE Cs, we analyze the research conduct of credit scoring model that have been implemented [2].

The development of an app to manage nutritious school lunch programs is part of a broader effort to integrate technology into education and nutrition support systems. Various studies have explored the use of digital tools to improve school meal management and distribution. For example, Zhou et al. [3] developed a mobile app that tracks students' dietary needs and food preferences, thus enabling personalized meal planning. This study demonstrated the effectiveness of utilizing user data to customize food choices and improve nutritional outcomes.

Similarly, Choi and Lee [4] implemented a blockchain-based system to ensure transparency and accountability of school lunch programs. Their approach addresses common problems such as wastage and misallocation of resources, ensuring that the food supply is distributed efficiently and reaches the intended beneficiaries. The decentralized nature of the system increases trust and reduces the potential for fraud.

Previous research has demonstrated the potential of Agile methodology in software development for educational aids. According to Martinez et al.[5], the Agile approach allows for iterative development and continuous feedback, which is essential to meet dynamic user needs in an educational environment. The flexibility of the Agile method supports the incorporation of user feedback, which makes it easier for users to understand the software.

Another relevant study was conducted by Kumar and Singh [6] who introduced a comprehensive digital platform to manage various aspects of school administration, including meal programs. The study highlighted the importance of integrating various modules, such as attendance tracking and academic performance, to provide a holistic view of each student's needs and support services. The integration of these modules helps to streamline administrative tasks and improve the overall operational efficiency of the school.

In the context of school meal programs, the work of Smith et al. [7] is particularly noteworthy. They developed a web-based application that utilizes machine learning algorithms to predict the nutritional needs of students based on their health records and activity levels. This predictive capability allows for better meal planning and allocation, ensuring that students receive proper nutrition.

Furthermore, Jones and Patel [8] explored the use of Internet of Things (IoT) devices in monitoring and managing school lunch programs. Their system includes smart sensors to track food supply levels and environmental conditions in storage areas. This real-time monitoring helps prevent food spoilage and ensures that fresh ingredients are always available for meal preparation.

The study conducted by Ahmed and Rahman [9] focused on user engagement and satisfaction with digital tools in school meal programs. They conducted surveys and interviews with students, parents, and school staff to assess the usability and effectiveness of the implemented app. Their findings emphasized the importance of intuitive design and responsive support in ensuring high user satisfaction and sustained engagement.

Collectively, these studies underscore the significant potential of digital tools in improving the efficiency, transparency and user satisfaction of school meal programs. The application of Agile methodologies and advanced technologies such as blockchain, machine learning, and IoT has opened up new avenues to optimize the management and delivery of nutritious meals to students.

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This paper focuses on the use of AI in the context of school meal programs and its potential to support the transition to a more sustainable food system. This study explores the implementation of artificial intelligence (AI) tools for managing school nutrition programs in the United States. Through a case study of a software company providing AI-powered solutions to schools, the research examines how AI can automate and streamline administrative processes related to meal planning, nutritional reporting, and compliance with federal guidelines.

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This paper presents an integrated framework for mobile application development that combines mobile-specific challenges with agile software development processes. [11]

authors Ellen van Kleef et all Identifying factors that influence the implementation of school lunch programs from the perspective of school professionals.Context for this paper In the Netherlands, school lunch programs are not common, but there are potential health benefits from their implementation. [12]

The main context of this journal is to successfully develop and validate a web-based self-diagnostic questionnaire. The final version facilitates knowledge mobilization with school stakeholders and offers new opportunities for assessment and surveillance of school food offerings. [13]

This study evaluated the perspective of school food service authorities (SFAs) in California on universal school meals (USM) in response to the COVID-19 pandemic (2021-22 school year) as well as USM policies to be implemented in California in 2022-23 school year. Reported benefits included increased student meal participation (79.2[14]

3. Methodology

3.1. Selection of Agile Methods

The Agile development method was chosen for the development of a school lunch program nutrition application because of its advantages in flexibility, responsiveness to change, and focus on team collaboration. In the context of application development that requires rapid adaptation to user needs and environmental changes, an Agile approach allows teams to easily adjust priorities and functionality in each development iteration. Compared to traditional development methods, such as waterfall, Agile is more able to accommodate changing needs and feedback from users efficiently.

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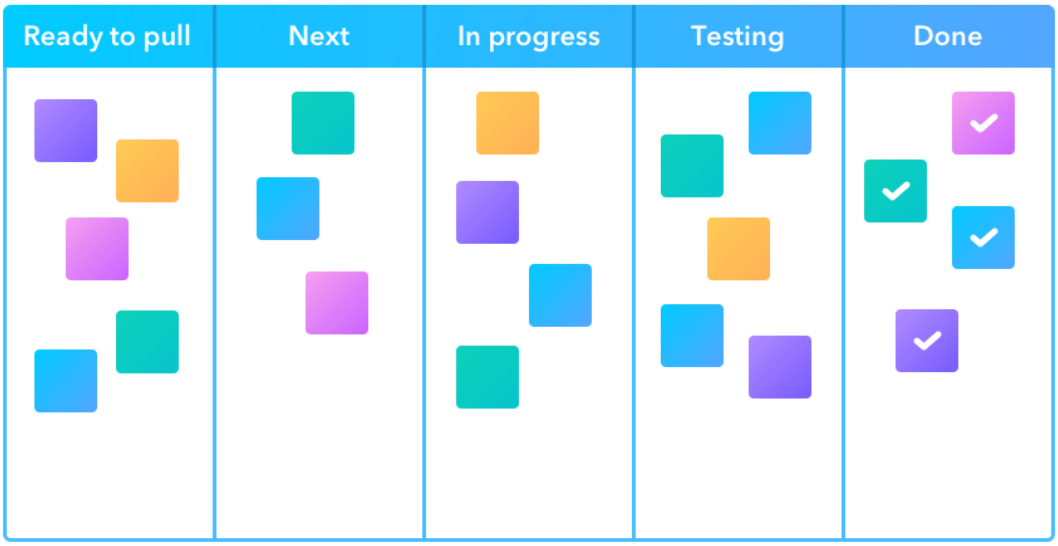

Figure 1. Agile with Kanban Board Development Life Cycle

Another advantage of Agile is the greater involvement of stakeholders, such as end users, in the development process. With short iterations and continuous development cycles, stakeholders can more actively provide feedback and participate in the evaluation process. This improves the final product quality and user satisfaction.

In comparison to other development methods, such as waterfall which follows a linear and rigid approach, Agile allows developers to be more responsive to changing user needs and requests. Additionally, the focus on team collaboration and open communication in Agile methods facilitates more effective problem solving and strengthens the quality of the final product.

3.2. Planning

To ensure the app meets user expectations, conducted a thorough needs analysis is important. Functional requirements include key features that must be present in the app such as user login, lunch claims, and menu management. While non-functional requirements include performance, security, and user experience. Technical specifications detail the technologies and tools used, including front-end and back-end frameworks, as well as integration with databases and cloud services.Functional requirements include several important things. First, a student data management system that includes recording student meal receipts to manage lunch claims. Second, a minimalist and user-friendly UI/UX designed to make it easier for students to order food. Third, a food inventory monitoring feature that allows for monitoring the school's food inventory to ensure sufficient menu availability. Fourth, a student food consumption report that serves to generate reports on student food consumption for analysis and evaluation.Non-functional requirements are also important to note. Strong data security is implemented with the use of .env files to store sensitive information such as secret keys and other configurations. In addition, the use of JSON Web Token (JWT) for authentication encryption ensures that passwords stored in MongoDB are not visible in their original form. Database availability and performance are also prioritized, with the MongoDB database implemented using serverless services on Google Cloud Platform (GCP) to ensure optimal availability and uptime. In addition, a minimum of 1 CPU unit available on Google Cloud Platform (GCP) is required to maintain the performance and responsiveness of the MongoDB database.The technical specifications of this application include a design created using Figma, a front-end framework using React.js, and a back-end framework using Node.js with Express.js for RESTful API development. The database used is MongoDB Atlas, with

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cloud hosting services using Vercel. Application security is maintained with the use of JSON Web Tokens (JWT) for authentication and authorization.

3.3. Agile Steps in Project

In implementing the Agile method for developing a school lunch program nutrition application, the steps to be taken include a series of structured and organized processes to ensure the smooth running of the project and efficient achievement of goals.

First, in the Preliminary Planning (Initiation) phase, is to identify and define the project objectives and scope in a clear and detailed manner. Also, form a project team with clear roles and responsibilities, as previously explained. Next, is create a product backlog that includes all the features, tasks and requirements of the project, and define the first sprints and plan the activities that will be carried out in each sprint.

Second, during Sprint Execution, start with the first sprint by focusing on the most priority and urgent tasks. Then carry out daily stand-up meetings to synchronize progress, identify obstacles, and ensure the involvement of all team members. Also use the Kanban board tool within monday.com to track the status and progress of each task, and each team member will be responsible for completing the tasks assigned in the sprint.

Third, in the Monitoring and Evaluation phase, periodically monitor progress using Gantt charts and project reports on monday.com to ensure that the project is on the right track. At the end of each sprint is to conduct a sprint evaluation which includes a review of the work that has been done, evaluation of success, and discussion of changes or improvements needed.

Fourth, in the Adapt and Improve (Retrospective) phase, hold a retrospective meeting to identify lessons learned, issues encountered, and suggestions for improvements for the next sprint. Also implement necessary changes or improvements based on retrospective results to improve the efficiency and quality of team work.

Tools and techniques to be used for Agile project management include monday.com for organizing task lists, tracking status, displaying progress in Gantt charts, Kanban boards, and graphical project reports, as well as WhatsApp group chat for real-time communication and collaboration between team members . Also use regular sprint planning, daily stand-up meetings, and retrospectives to ensure team involvement and timely project adjustments.

3.4. Development Team

The school lunch program nutrition application development team consists of various roles that have specific responsibilities in achieving the predetermined development goals. Rd Imam Saepul Millah is responsible as Quality Assurance to ensure the quality of the products produced is in accordance with established standards. Duties include functional and non-functional testing, bug identification, and preparation of comprehensive test results reports. Apart from that, Rd Imam also acts as a supervisor of the entire development process, providing suggestions and recommendations for improvements, and ensuring the application meets user needs.

Reski Firmansyah assumes the role of Software Architect to design the overall structure of the application to meet functional and non-functional requirements. Duties include selecting the right technology, designing system architecture, and ensuring smooth integration between various application components. Reski is also responsible for managing dependencies between features, ensuring scalability and overall application security.

Meanwhile, Ridwan Ahmad Fauzan acts as Project Manager who coordinates all development activities, manages resources, and ensures the project goes according to plan. Responsibilities include project planning, progress monitoring, risk identification, and troubleshooting problems that may arise during development. Ridwan also acts as a liaison between the development team and external stakeholders, such as project stakeholders and end users.

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Furthermore, Siti Jahro Maulidiyah was responsible as UI UX Designer for designing an attractive, intuitive and responsive user interface. Duties include analyzing user needs, designing wireframes and prototypes, and user experience testing to ensure the application provides an optimal experience. Close collaboration with other development teams is required to align the interface design with the application functionality being carried.

Teuku Muhammad Saif assumes the role of Backend Developer to develop business logic and ensure good integration between frontend and database. Duties include selecting appropriate backend technologies, API development, data management, and overall system performance optimization. Collaboration with the Frontend Developer and Software Architecture teams is important to ensure a robust and responsive application architecture.

On the other hand, Wildan Sophal Jamil is a Frontend Developer who focuses on developing web-based user interfaces that are attractive and easy to use. Duties include implementing UI UX design, integration with backend, user interface testing, and frontend maintenance of the application. Close collaboration with UI UX Designer, Backend Developer, and Software Architecture is necessary to create a consistent and intuitive user experience.

In developing this application, a team consisting of several members with different roles and responsibilities. Below is a list of team members and their roles in the project

Table 1. Development Team Members and Roles.

Name	**Role**
Rd Imam Saepul Millah	Quality Assurance
Resky Firmansyah	Software Architecture
Ridwan Ahmad Fauzan	Project Manager
Siti Jahro Maulidiyah	UI UX Designer
Teuku Muhammad Saif	Backend Developer
Wildan Sophal Jamil	Frontend Developer

Collaboration between development team members is carried out through various communication channels and active cooperation at every stage of development. Regular meetings such as daily stand-up meetings are used to update progress status, identify obstacles, and coordinate next steps. Additionally, project management tools such as *monday.com* used to organize tasks, monitor progress, and share important files within a team. Intensive discussions took place in the development of key features, where collaboration between Software Architecture, Backend Developers, and Frontend Developers became crucial for the overall alignment and cohesion of the application.

Overall, effective collaboration and solid teamwork are the keys to successfully achieving the goals of developing a school lunch program nutrition application. Each team member brings valuable contributions according to their roles and responsibilities, creating a productive and innovative work environment.

3.5. Testing Process

In our Agile development cycle, testing plays an important role to ensure that the application being developed meets user requirements and functions well. The testing process that implement includes several interrelated stages to ensure the quality and reliability of the application.

3.5.1. Unit Testing

In the early steps of development, each developer is responsible for performing unit testing on the pieces of code they write. Unit testing is performed to ensure that each application component functions properly in isolation. Front-end developers will test the front-end UI and logic, while back-end developers will test the back-end functionality. This includes functionality testing, error handling, and integration with databases or other services.

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3.5.2. Front-end dan Back-end Integration

Once done with development and unit testing, will carry out integration between front-end and back-end. This involves integration testing to ensure that all components work well together in an integrated environment. Integration testing is important to ensure that no errors or conflicts arise when these components interact with each other.

3.5.3. Black Box Testing

Once the integration is complete, continue with black box testing. This type of testing is performed from an end-user perspective, where the main focus is to thoroughly test the functionality of the application from the outside without paying attention to internal implementation details. Black box testing includes testing various user scenarios, functional testing, performance testing, and security testing. The main goal of black box testing is to ensure that the application can be used safely and according to user needs.

Table 2. Result Testing.

Feature	User	Method	Status
Login Student	Student	Equivalence Partitioning	Valid
Login Staff	Staff	Equivalence Partitioning	Valid
Claim Menu	Staff	Boundary Value Analysis	Valid
Claim Mandiri	Student	Boundary Value Analysis	Valid
Manage Menu	Staff	State Transition	Valid
Navigation	Student	State Transition	Valid
Logout	Student	State Transition	Valid
Home : Get Started	Both	State Transition	Valid
View Profile	Student	State Transition	Valid
Edit Profile	Student	State Transition	Valid
Edit Password	Student	State Transition	Valid

In this testing process, are use various testing methods and techniques such as equivalence partitioning, boundary value analysis, state transition testing, and exploratory testing to identify and fix any problems or bugs that may arise in our application. This testing also involves strong teamwork between developers, quality assurance, and testing teams to ensure that all aspects of testing are carried out well and according to established standards.

3.6. Flow of Development

The development flow in our project starts with an in-depth requirements analysis stage. This involves a solid understanding of end user needs, project goals, as well as the scope of features to be developed. Once the analysis is complete, enter the planning phase which involves determining key milestones and creating a detailed project schedule. These milestones include design, development, testing, and launch stages.

After planning, design the overall system involving technical architecture, user interface, database and system integration. The design is detailed and agreed with the team to ensure compliance with the project requirements. Then, enter the active development stage where the team starts implementing the design into real code.

During the development phase, perform continuous unit and integration testing. Every feature is thoroughly tested to ensure its functionality is as intended. As approach the end of the development cycle, will perform thorough system testing using pre-prepared test scenarios.

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Finally, once all the testing is complete and the app has passed all the tests, make preparations for launch. This includes infrastructure preparation, end user training, documentation maintenance, and application deployment to a production environment. After launch, continue to carry out maintenance and updates according to user feedback to ensure the app remains high quality.

4. Result and Discussion

The Nourishify School Lunch app development project has successfully achieved its desired goals with some notable achievements, The app is able to improve efficiency in the management and distribution of school meals, allowing students to claim their meals easily and school staff to manage menus effectively, User-Friendly, With an intuitive and functional interface design, the app is easy to use by all users, both students and administrators. Security and Privacy: A strong focus on user data security and privacy ensures adequate protection for students' and staff's personal information. As such,Nourishify offers an innovative and practical solution to support student health and well-being through a well-managed lunch program. This project has made a significant contribution to the improvement of technology-based public services in the school environment. Hopefully, this report will provide useful insights and serve as a useful reference for the development of future software projects.

4.1. Planning

To ensure the app meets user expectations, conducted a thorough needs analysis. Functional requirements include key features that must be present in the app such as user login, lunch claims, and menu management. While non-functional requirements include performance, security, and user experience. Technical specifications detail the technologies and tools used, including front-end and back-end frameworks, as well as integration with databases and cloud services.Functional requirements include several important things. First, a student data management system that includes recording student meal receipts to manage lunch claims. Second, a minimalist and user-friendly UI/UX designed to make it easier for students to order food.

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The Nourishify project schedule is organized to ensure that each phase of development is completed on time and as planned. This schedule covers the various stages of the project objectives from design to implementation and final completion. Each phase has specific tasks and clear deadlines. A Gantt chart visualizes the progress of the project and assists the team in tracking each task and adjusting the schedule as needed. This ensures that the project stays on track and the end goal is achieved efficiently. Project Objectives During the design phase, the team conducts a user needs analysis to determine the key features required for the application. The planning phase then begins by creating a detailed development plan, including allocating resources and setting deadlines for each task. The development phase is divided into sprints, and each sprint lasts for two weeks. Each sprint has specific

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objectives, such as the development of a healthy menu module, a nutrition recommendation system, and integration with the school database. At the end of each sprint, the team conducts reviews and retrospectives to assess progress and identify opportunities for improvement. The testing phase begins once most of the key features are developed.

Thorough testing is done to ensure that the app is bug-free and meets the set quality standards. This testing includes functional testing, security testing and user testing to get direct feedback from end-users. Once all the bugs are fixed and user feedback is applied, the deployment phase begins. The application is deployed to production and the team monitors it to ensure there are no issues after startup. The final completion phase includes complete documentation of the application and handover of the project to stakeholders. By keeping a structured schedule and using tools like Gantt charts, the team can complete each phase of the Nourishify project efficiently and on time to achieve the desired end goal.

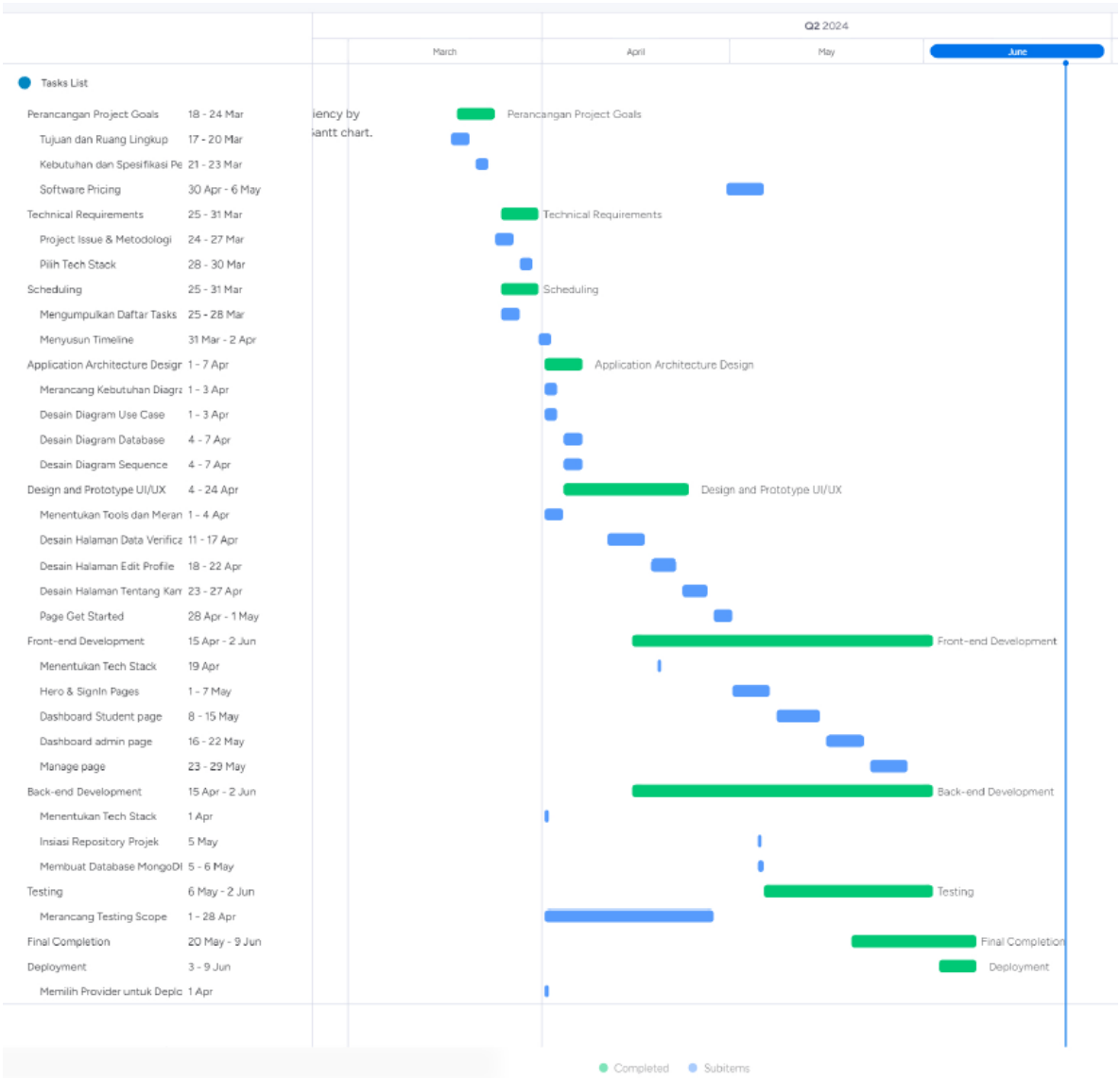

Figure 2. gantt chart

4.2. Budgeting

Budgeting is a vital part Nurishify project plan, ensuring that every aspect of the app development cycle is adequately funded. It's important to estimate the costs associated with the work, including salaries for developers, designers, and project managers. These expenses will vary depending on

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the experience level and location of the professionals involved. Additionally, the budget should also account for the cost of the necessary software and hardware. This includes purchasing licenses for development tools, design software, and specialized equipment required for testing and deployment. Properly estimating these costs will help to avoid unexpected expenses and ensure that project stays financially and on schedule.

Additionally, the budget should also include operational costs such as hosting and cloud services, which are important to keep app performing and available to users. It's important to consider the costs of different hosting providers and cloud platforms, compare features and prices, and choose the most cost-effective solution. Additionally, it's essential to budget for ongoing maintenance and updates, as this will ensure app remains functional and secure over the long term. Creating a detailed and comprehensive budget plan will help to execute Nurishify project efficiently, effectively and make optimal use of resources to ensure the completion of app development cycle.

1. Minimum Wage Reference

Table 3. Minimum Wage.

Region	**RMW**
Bandung City	Rp4.048.462,69,-

2. Work Hours Based

Table 4. Wage Calculation Based On Working Hours.

Position	**Work Hours Total**	**Fee Total**
Project Manager	92	Rp18.407.666,67
Software Architect	30	Rp10.163.293,00
Quality Assurance	29	Rp5.026.666,67
UI/UX Designer	30	Rp4.650.000,00
Front-end Developer	39	Rp7.150.000,00
Back-end Developer	39	Rp9.320.355,20

3. Cost Plus Pricing Method

Table 5. Cost Plus Pricing.

Service	**Price**
Project Management tools	Rp0,00
Wireframing tools	Rp0,00
Design Prototyping tools	Rp0,00
Cloud Service	Rp16.000,00
Total	Rp16.000,00

4. Feature-based Pricing

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Table 6. Feature-based Pricing.

Feature	Price
User Login	Rp500.000,00
View and Profile Edit	Rp1.000.000,00
Admin Login	Rp500.000,00
Lunch Menu Edit	Rp400.000,00
Lunch Stock Edit	Rp300.000,00
Lunch Claim by ID	Rp400.000,00
User Logout	Rp400.000,00
Admin Logout	Rp400.000,00
Landing Page	Rp300.000,00
Admin Dashboard	Rp750.000,00
Admin Login	Rp300.000,00
User Dashboard	Rp750.000,00
User Login	Rp300.000,00
User Edit Profile	Rp500.000,00

This detailed budgeting provides a comprehensive overview of the estimated costs associated with the development of the Nourishify project. The total project cost, including team salaries, software and hardware costs, and cloud services used, is Rp61,517,981.53, ensuring optimal use of available resources to efficiently achieve the project goals.

4.3. Design System

This section provides an overview of the system design used in the development of the Nourishify app. The system design describes the overall structure of the application, including interactions between users, key components, and the flow of information in the system. Use cases, database schemas, and activity diagrams are used as visual tools to clarify the system design that has been developed. These visual aids help to ensure a clear understanding of the application's functionality and data flow, facilitating effective communication among the development team and stakeholders. By leveraging these tools, the design phase can more accurately translate into a robust and user-friendly application.

1. Use Case Diagram

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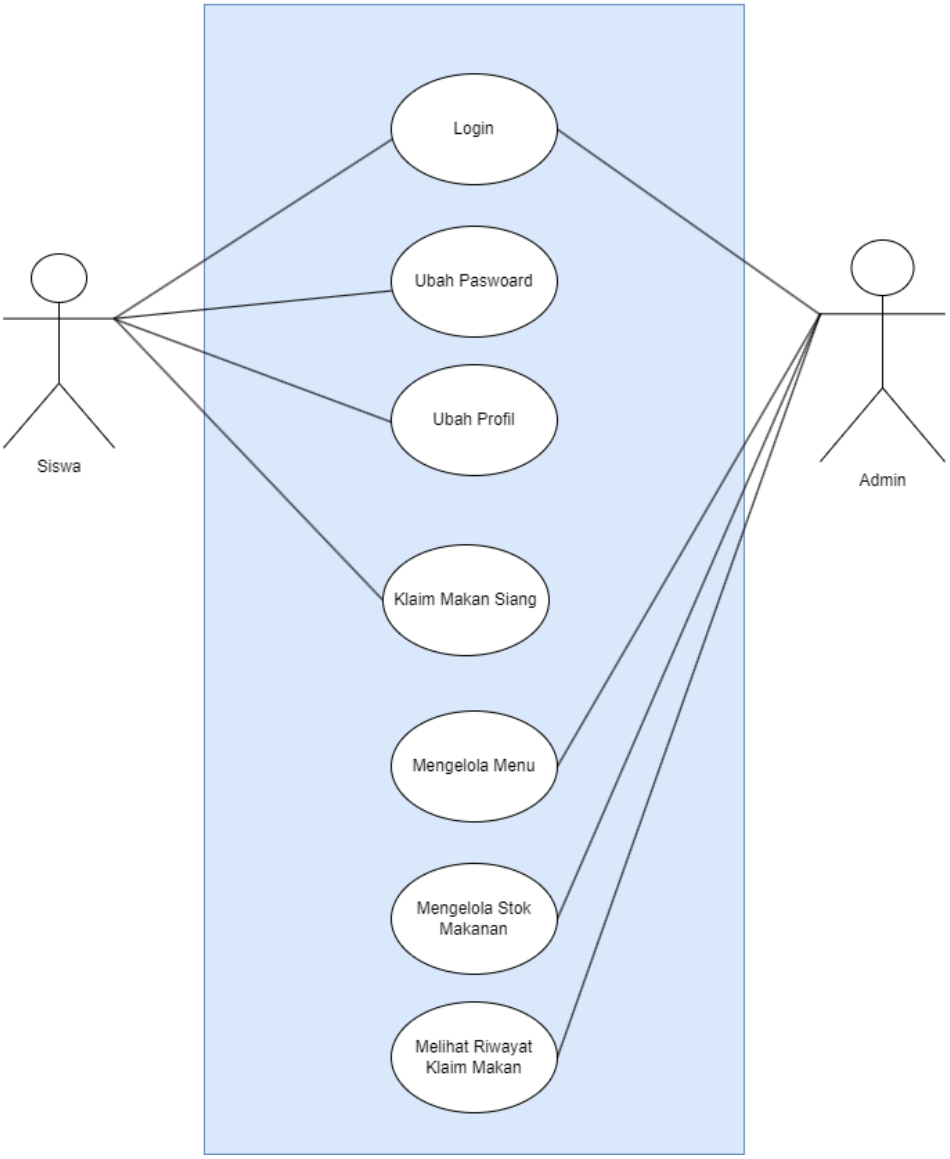

Figure 3. use case diagram

Use Case Diagrams describe the various interactions between actors (users) and the system in the Nourishify app. This diagram helps visualize the main functionality provided by the app and how each actor interacts with the system. In this case, the actors involved include students and school staff, with each having a specific set of actions they can perform within the app. This diagram helps the development team understand the user requirements and ensures that all important functionality is identified and properly planned.

2. Schema Database

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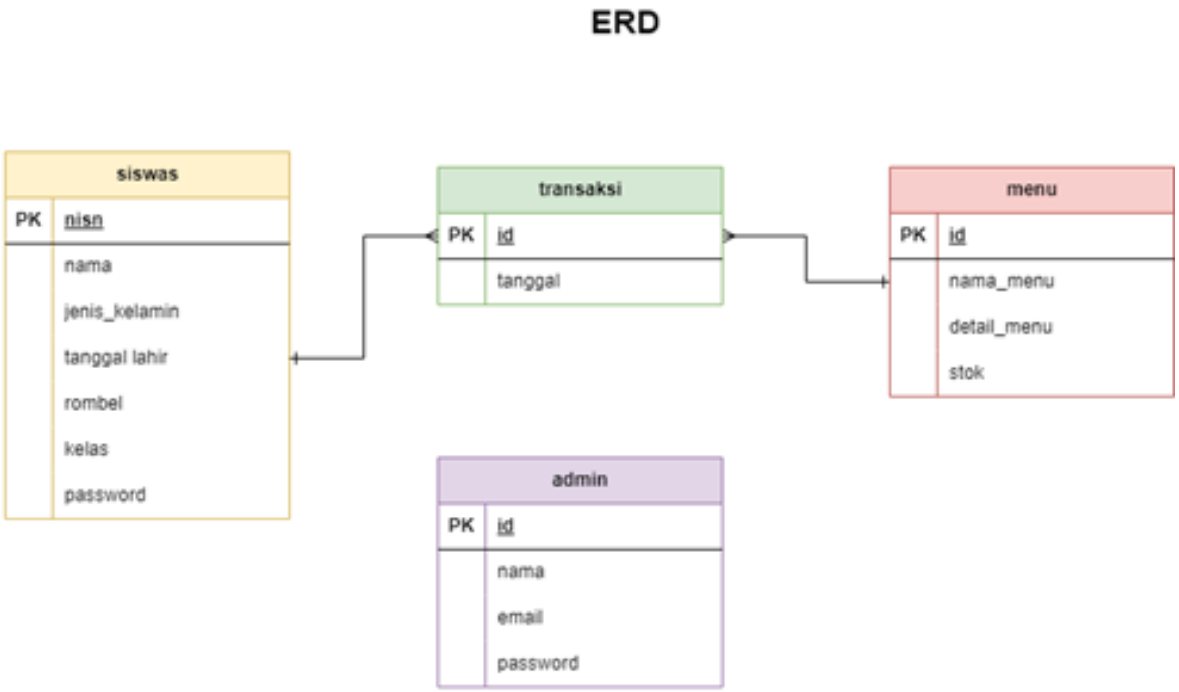

Figure 4. Database Schema

The Database Schema describes the data structure used in the Nourishify application. This database is designed to store important information such as user data (students and staff), lunch menu details, meal claim status, and transaction history. The database schema diagram helps in understanding the relationships between data and ensures data integrity and consistency across the system.

3. Activity Diagram

Activity Diagrams are used to model the main workflows and activities in the Nourishify app. This diagram helps in understanding how users interact with the system and how the internal processes of the app run. The diagram depicts the various user activities and management processes in the app.

a. Login, change password, and profile edit

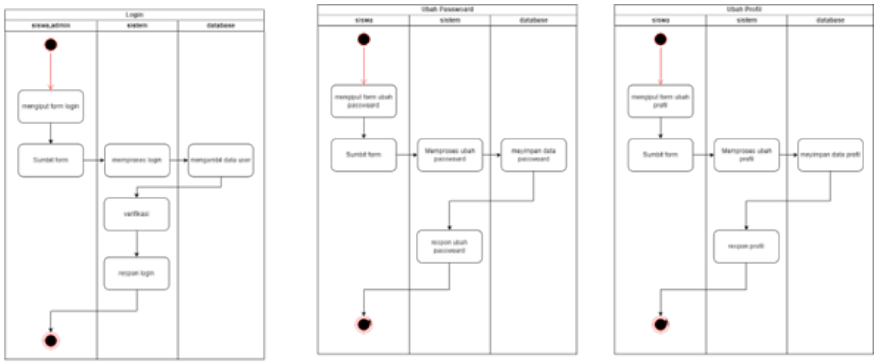

Figure 5. Activity Diagram I

b. Lunch claim and menu managing

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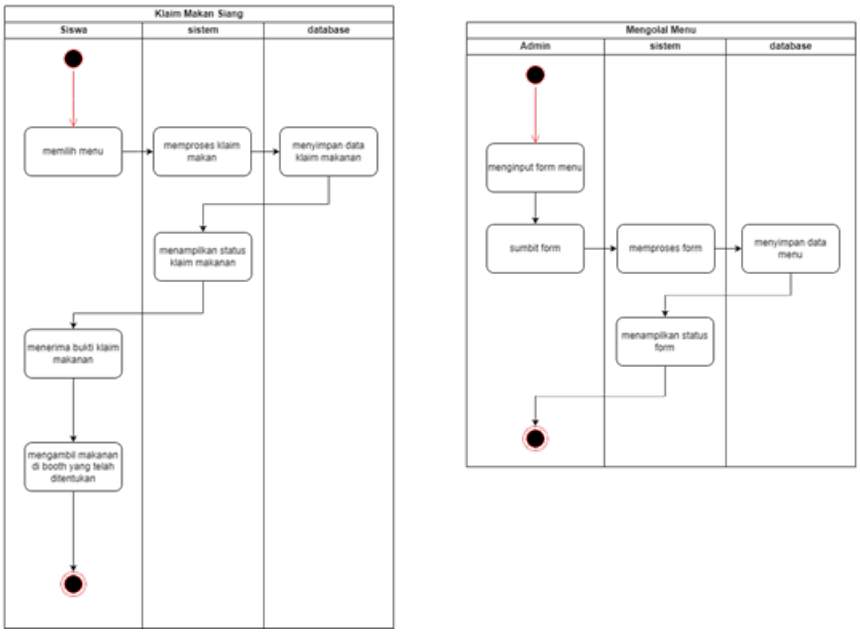

Figure 6. Activity Diagram II

c. Stock manage and history

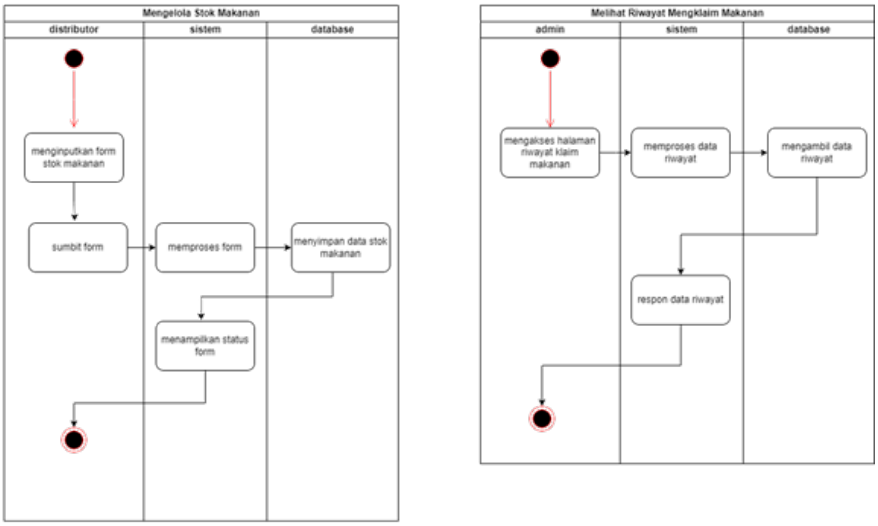

Figure 7. Activity Diagram III

4.4. Requirement Analysis

To ensure the application meets user expectations, conducted a comprehensive needs analysis. This analysis is divided into three main categories: functional requirements, non-functional requirements, and technical specifications.

1. Functional Requirements

- Student Data Management System

  The application should be capable of recording and managing student meal intake data. This is essential for tracking and validating lunch claims.

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- Minimalist and User-Friendly UI/UX

  The user interface should be designed to be simple and intuitive. This will enable students to easily navigate the application and perform tasks such as ordering meals with minimal effort.

- Food Inventory Monitoring Feature

  The system must provide functionality to monitor the school's food inventory. This will ensure that there is always enough food available to meet the demand and prevent shortages.

- Student Meal Consumption Reports

  The application should generate detailed reports on student meal consumption. These reports will be used for analysis and evaluation to understand food preferences and optimize meal planning.

2. Non-Functional Requirements

   - Robust Data Security
     - Implement strong data security measures using `.env` files to safely store sensitive information like API keys and configuration settings.
     - Use JSON Web Tokens (JWT) for authentication and authorization to ensure that user credentials and session data are encrypted and secure.

   - Database Availability and Performance
     - Deploy the MongoDB database using serverless services on Google Cloud Platform (GCP) to ensure high availability and resilience.
     - Ensure that at least one CPU unit is available on GCP to maintain optimal performance and responsiveness of the MongoDB database, providing a smooth user experience. In addition, monitor the CPU usage regularly to anticipate any spikes in demand and adjust resources accordingly. This proactive approach helps in preventing potential bottlenecks and ensures the database can handle concurrent requests efficiently. Furthermore, implementing automatic scaling can dynamically allocate additional CPU resources during peak times, thereby maintaining consistent performance and minimizing downtime.

3. Technical Specifications

   - Design Tool: Utilize Figma for designing and prototyping the user interface to create a visually appealing and functional design.

   - Front-end Framework: Use React.js for building a dynamic and responsive client-side interface that provides a seamless user experience.

   - Back-end Framework: Develop the server-side using Node.js with Express.js to create robust RESTful APIs that handle data processing and business logic.

   - Database: Employ MongoDB Atlas for database management to handle large volumes of student and inventory data efficiently.

   - Cloud Hosting Service: Host the application on Vercel to take advantage of its seamless deployment capabilities and high-performance hosting environment.

   - Security Mechanism: Implement JSON Web Tokens (JWT) to manage user authentication and authorization securely, ensuring data integrity and privacy.

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Table 7. Technical Specifications.

Design		Figma
Front-end and Back-end	Language Database	HTML, CSS, Javascript MongoDB Atlas
Framework		React JS, NodeJs, dan Express.js
Cloud Hosting		Vercel
Security		JSON Web Token (JWT)

4.5. Prototype Design

The prototype design of the web application for the nutritious school lunch program consists of several main pages, crafted using Figma to provide an intuitive and engaging user experience. The main page includes several key sections such as Hero, About, and Our Team. The Hero section functions as the main banner, displaying key messages and striking images that capture the users' attention. The About section provides detailed information about the application's purpose and the benefits of the nutritious school lunch program, while the Our Team section introduces the team members who contributed to the development of this application.

Additionally, there is a sign-in page designed to facilitate user access to their respective dashboards. The student dashboard allows students to view their lunch menu, provide feedback, and access nutritional information. The edit profile page enables students to update their personal information. The staff dashboard is designed for administrators and school staff, allowing them to manage the lunch menu, monitor feedback from students, and ensure that all nutritional information is always up-to-date. The menu management page allows administrators to add, edit, or delete menu items, ensuring that all provided menus meet the established nutritional standards.

4.6. Front-end Development

1. Use GitHub Version Control for Development Team

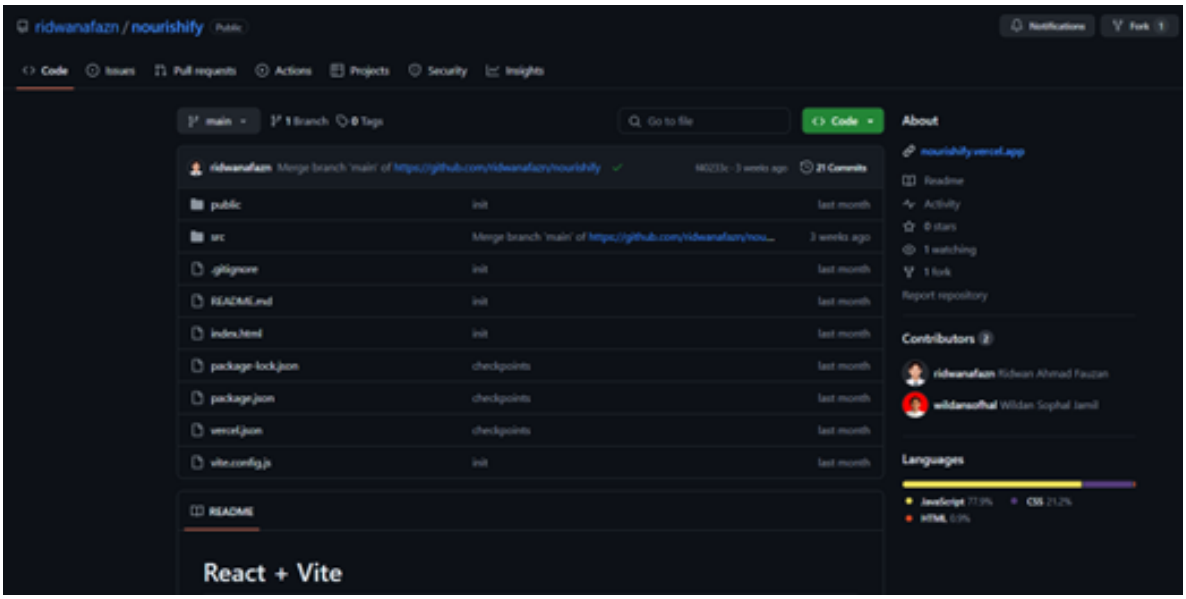

Figure 8. GitHub Version Control for Team Collaboration.

For efficient collaboration and effective version control, the development team utilized GitHub. This platform allowed for the seamless integration of code changes, issue tracking, and pull requests, thereby facilitating effective teamwork and continuous integration. Overall, GitHub significantly improved the development workflow.

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2. Homepage of Nourishify Website

a. Banner

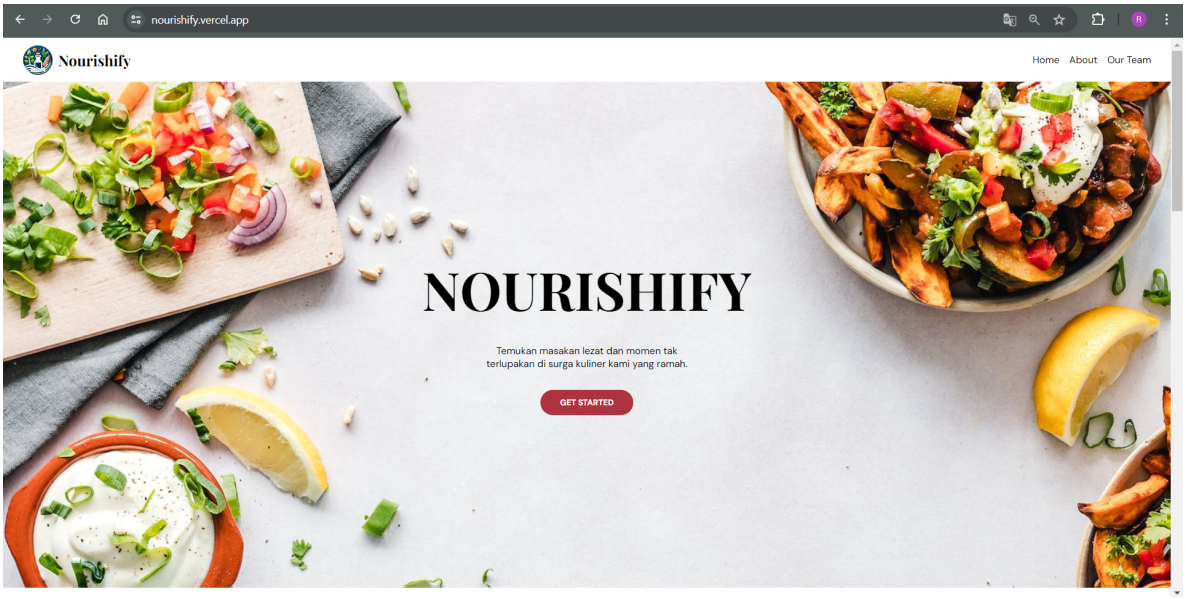

Figure 9. Website banner section.

The homepage banner section provides a visually appealing introduction to the website. It features high-quality images and a compelling call to action, designed to engage visitors and convey the core message of Nourishify. This section is crucial for capturing the attention of users upon their first visit, ensuring that they are immediately drawn in and encouraged to explore further.

b. About us

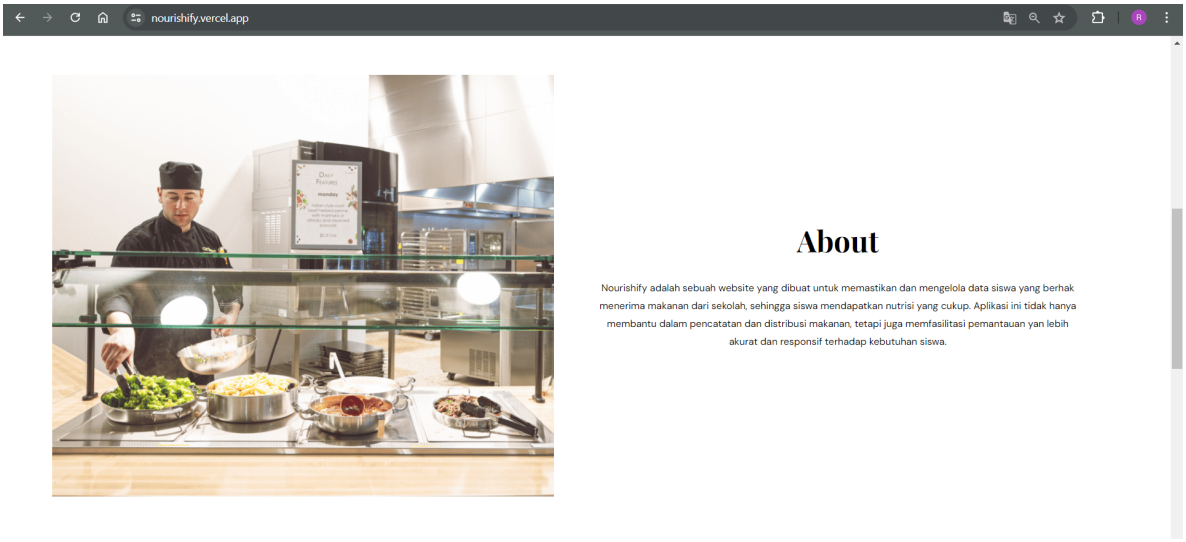

Figure 10. Website about section.

The about section offers a brief overview of the mission and vision of Nourishify. It highlights the organization's commitment to providing nutritious meals and fostering healthy eating habits among school children.

c. Meet Our Team

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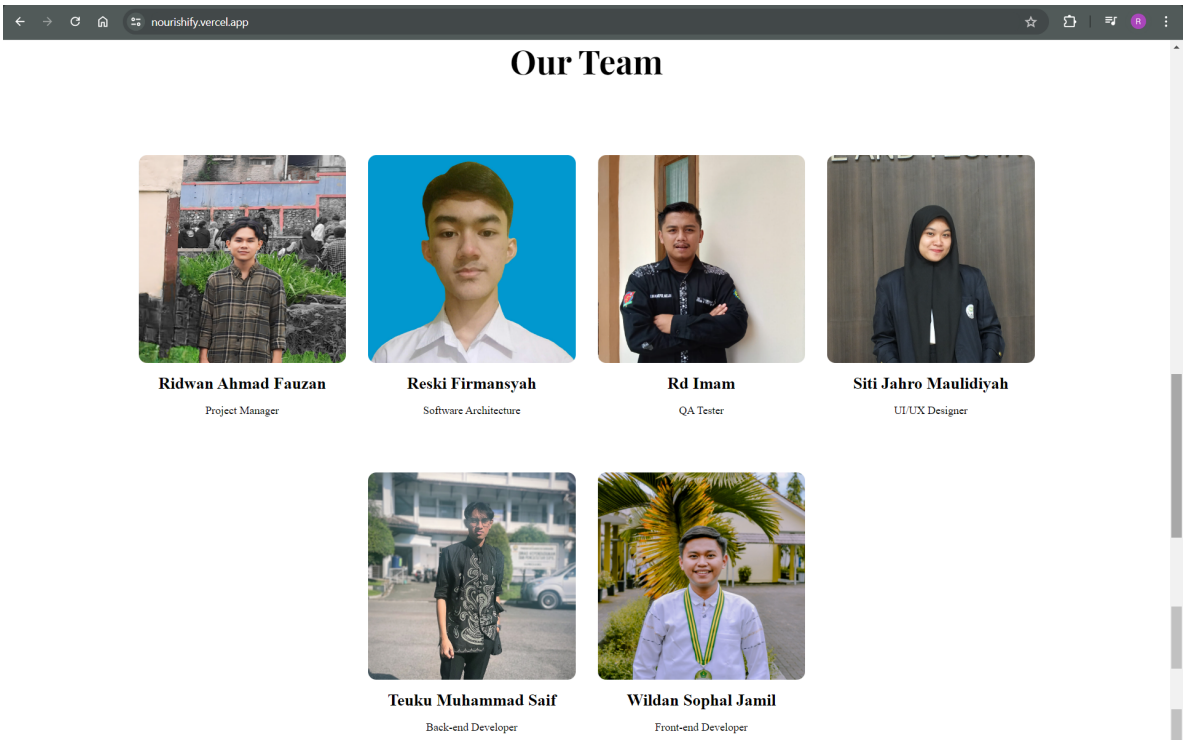

Figure 11. Website team section.

The team section introduces the key members of the Nourishify team, showcasing their expertise and dedication. This section builds trust and credibility, emphasizing the collaborative effort behind the initiative.

3. Sign In Pages

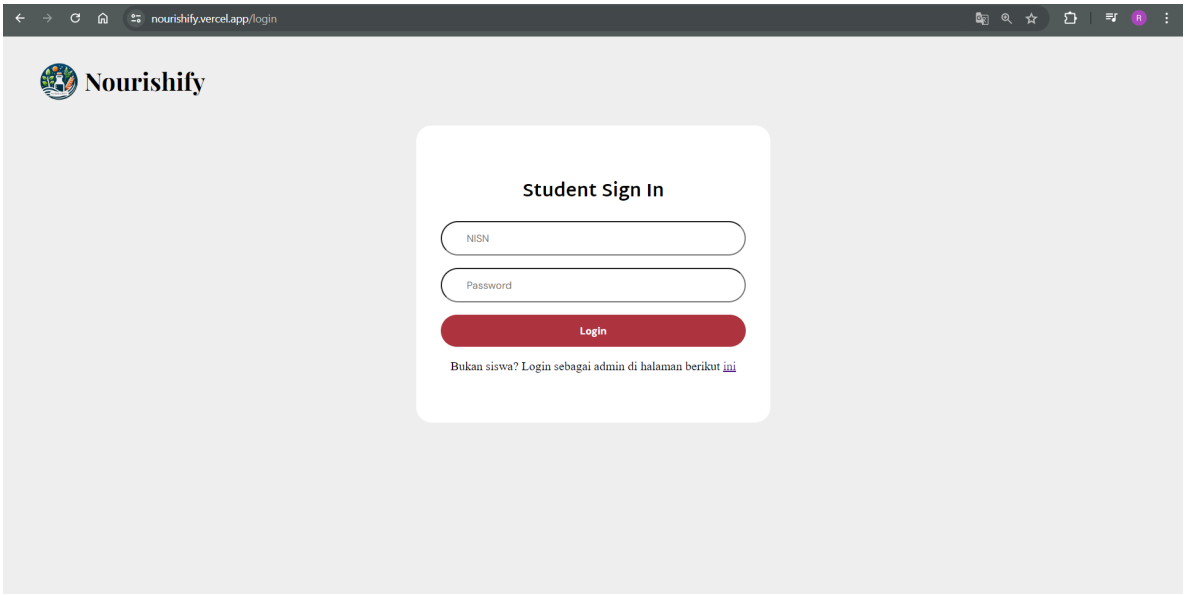

Figure 12. Sign In for Student Pages.

The sign-in page for students provides a user-friendly interface that allows students to easily access their accounts. It ensures that students can quickly log in and access their personalized dashboard, maintaining a smooth user experience.

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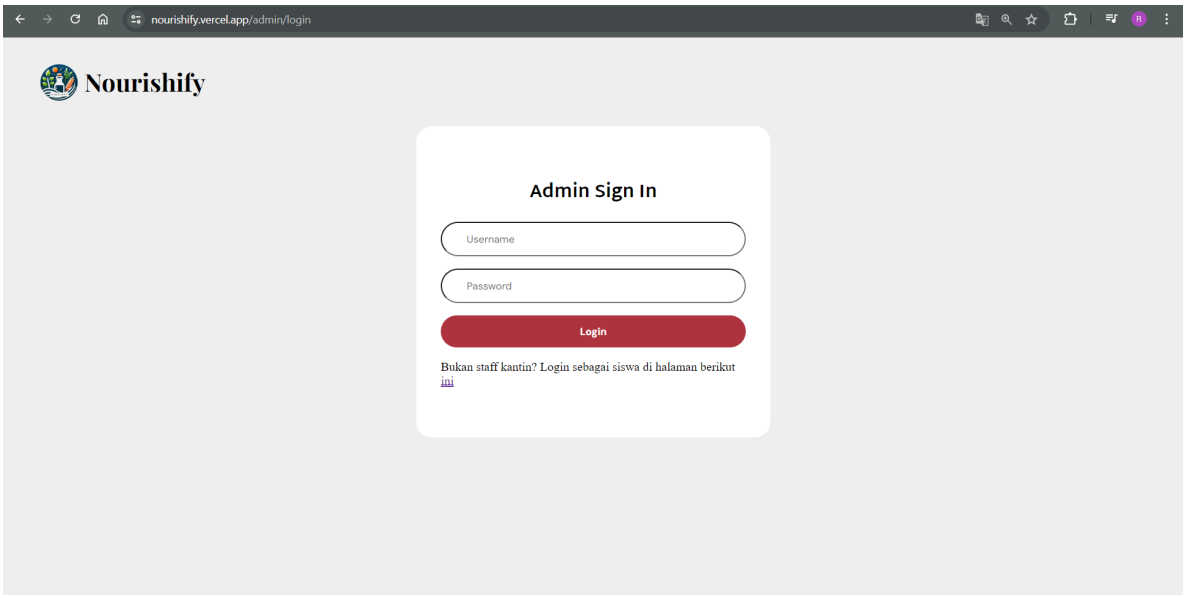

Figure 13. Sign In for Staff Pages.

The sign-in page for staff is designed to offer secure access for administrative and teaching personnel. This interface is tailored to meet the needs of staff members, enabling them to manage their tasks efficiently and securely.

4. Dashboard Pages

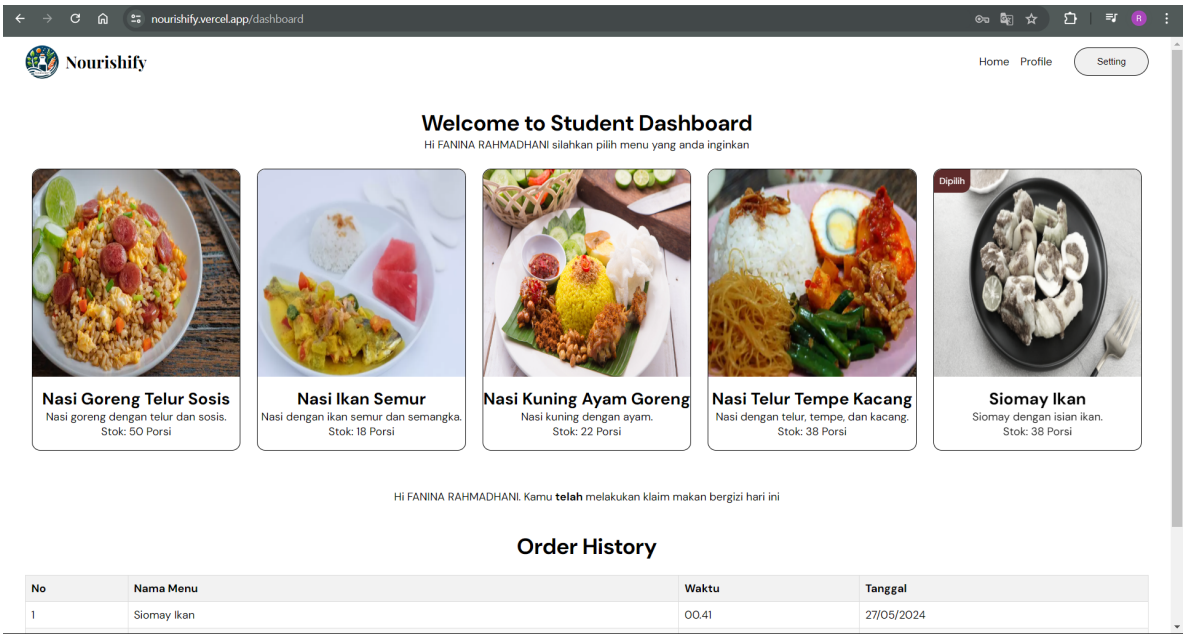

Figure 14. Dashboard page for students.

The dashboard page for students provides a comprehensive overview of their academic progress, upcoming tasks, and personalized recommendations. It serves as a central hub for students to manage their educational journey efficiently.

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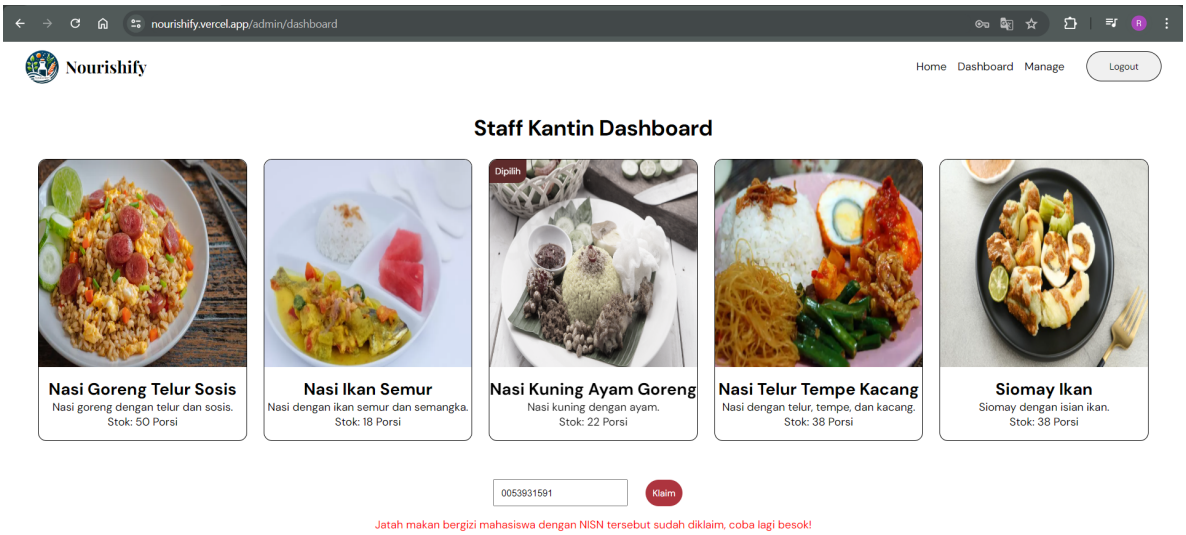

Figure 15. Dashboard page for Staff.

The dashboard page for staff members offers a range of administrative tools and insights to streamline their responsibilities. It enables staff to monitor student performance, create assignments, and track overall program success.

5. Student Profile

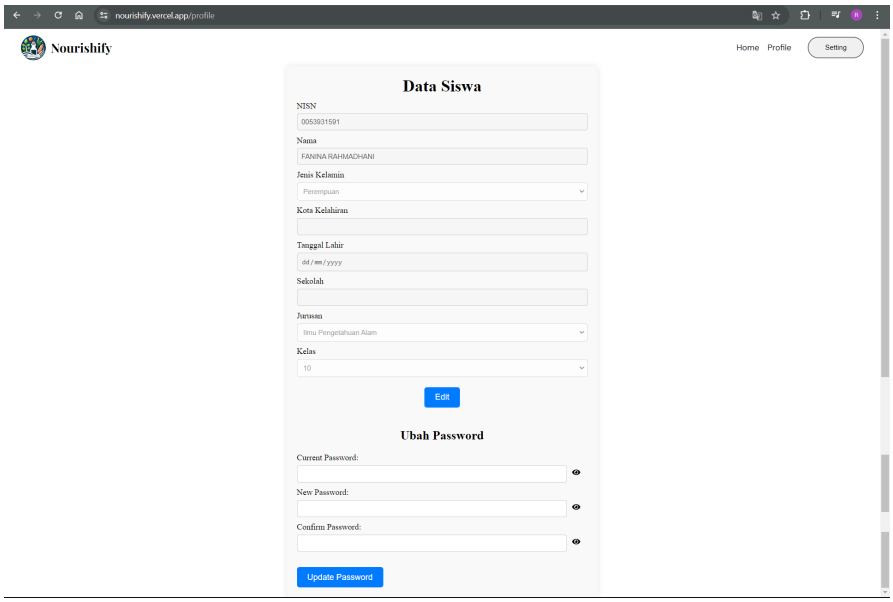

Figure 16. Users profile pages.

The student profile page is a comprehensive feature that empowers users to access and manage a variety of critical information. This includes their personal details, such as contact information, academic history which tracks their performance and achievements over time, and individual preferences that enhance their interaction with the system. By offering a tailored experience, the profile page ensures that each student can navigate their educational journey in a way that aligns with their unique needs and preferences, making it an indispensable tool for personalized learning.

6. Management Menu for Staff

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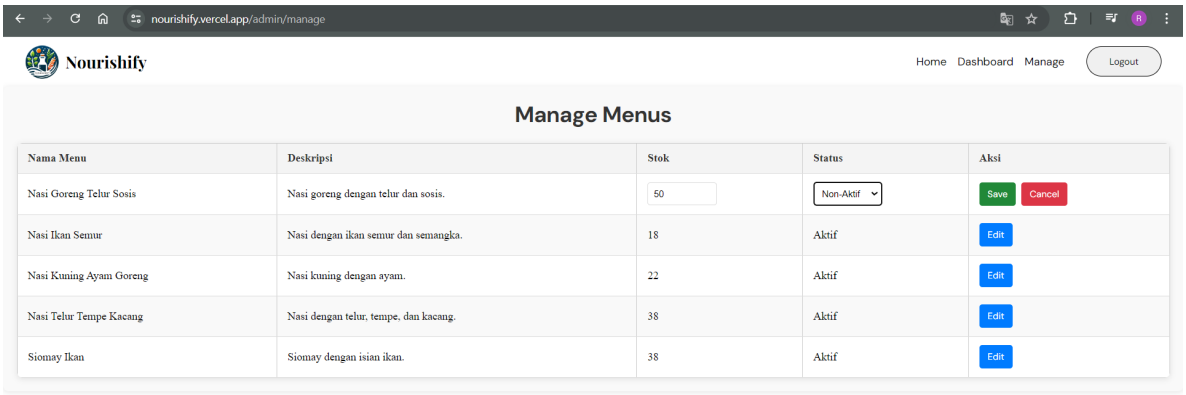

Figure 17. Menu management pages for Staff.

The management menu for staff members encompasses a comprehensive array of options designed to streamline program administration and enhance operational efficiency. Through this menu, staff can manage various aspects of the program, such as creating and editing course content, ensuring that the curriculum remains engaging and up-to-date. Specifically, the menu allows staff to handle menu items effectively, as seen on the Manage Menus page, where they can oversee the details of each menu item, including its name, description, stock status, and actions available.

4.7. Back-end Development

1. Use GitHub Version Control for Development Team

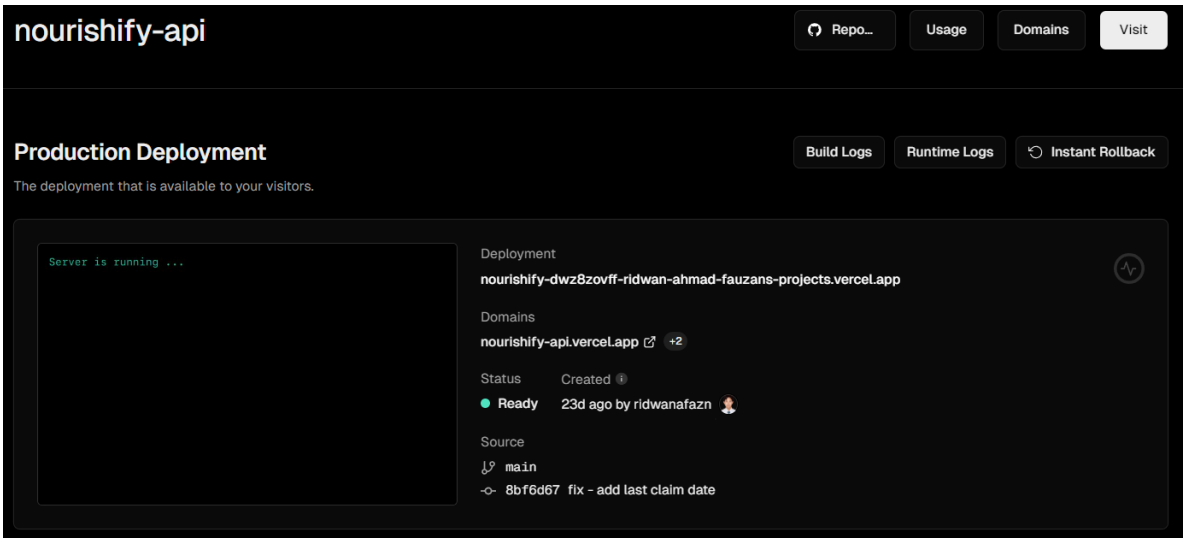

Figure 18. Backend API Deployment with Vercel.

The backend API deployment with Vercel provides a scalable and reliable infrastructure for handling user requests and data processing. It ensures high performance and availability, supporting the seamless operation of the Nourishify web application.

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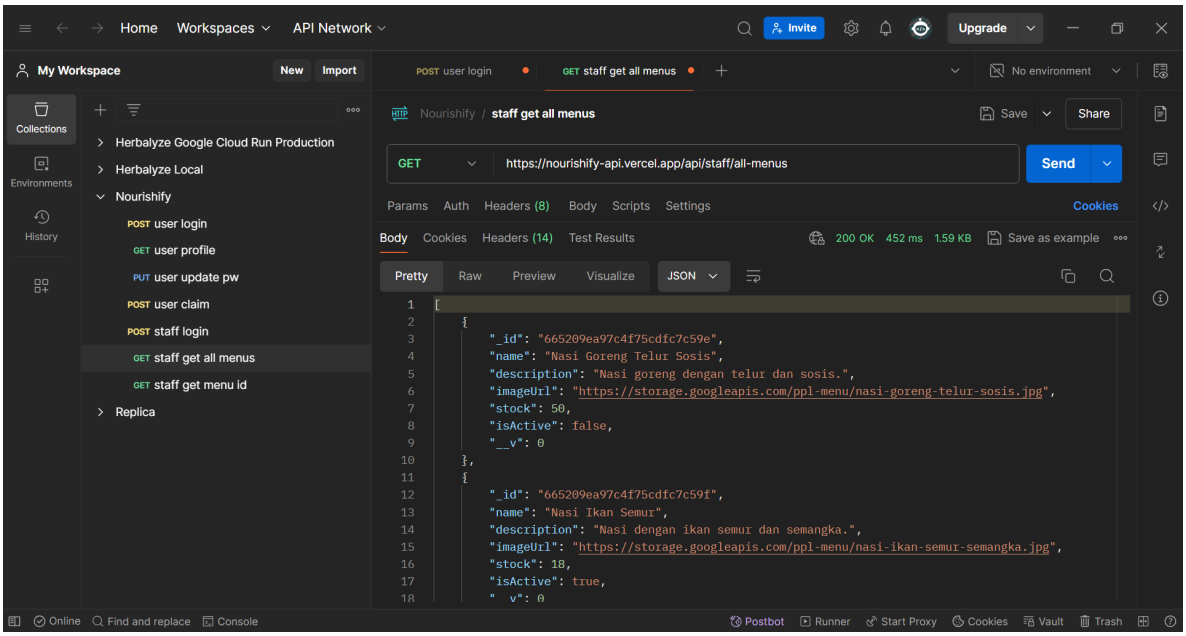

Figure 19. API testing with Postman.

API testing with Postman allows the development team to verify the functionality and performance of backend endpoints. It ensures that the API functions correctly, adheres to specifications, and handles various scenarios effectively.

4.8. Deployment

5. Conclusion

Developing the Nourishify app went through many steps: planning, designing, developing, testing, and releasing. Throughout this journey, we continuously evaluated and reflected on each stage of the project. The review includes observations on the achievement of project goals, team performance and the quality of the resulting product. Evaluating the success of meeting user needs, the efficient use of resources and the competitiveness of the application in the market is the key. Also retrospectives are key moments to review work processes and determine what went well and what needs to be improved. Furthermore, apply lessons learned from this project experience to improve the quality and effectiveness of our teamwork in the future. The app development project Nourishify: School Lunch app development project has successfully achieved its desired goals with some notable achievements:

- Efficient Management: The app was able to improve efficiency in the management and distribution of school meals, allowing students to claim their meals easily and school staff to manage menus effectively.
- User-Friendly: With an intuitive and functional interface design, the app is easy to use by all users, both students and administrators.
- Security and Privacy: A strong focus on user data security and privacy ensures adequate protection for students' and staff's personal information.

As such, Nourishify offers an innovative and practical solution to support student health and well-being through a well-managed lunch program. This project has made a significant contribution to the improvement of technology-based public services in the school environment. Hopefully, this report will provide useful insights and serve as a useful reference for the development of future software projects.

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We are also deeply grateful to our families and friends for their unwavering support and understanding throughout this journey. Their belief in us has been a constant source of strength and motivation.

Special thanks go to our colleagues and fellow students for their valuable discussions and assistance. Our camaraderie and collaboration have greatly enriched this experience.

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