Journal of Educational Social Science and Engineering
Vol. 1 No. 1 JUNE 2025

Development of An Information System for Tahfidz Single Tuition Fee Adjustment at UIN Ar-Raniry Using The Waterfall Method

Kaisa Zakia[1], Universitas Islam Negeri Ar-Raniry Banda Aceh, Indonesia

ABSTRACT

The Single Tuition Fee (UKT) Adjustment Program for Tahfidz UIN Ar-Raniry is an effort to provide appreciation to Al-Qur'an memorizers through fee relief. Previously, the registration process still used a manual method using Google Forms, which experienced obstacles in terms of data integration, tracking student history, and administrative efficiency. To overcome these obstacles, this study aims to develop a web-based information system called SIPUKTA (UKT Tahfidz Adjustment System). This system was developed using the Waterfall model which includes the stages of needs analysis, system design, implementation, and testing. The framework used is Laravel and this system supports main features such as student self-registration, memorization assessment by examiners, and automatic printing of exam cards. The results of black box testing show that all system functions run effectively and in accordance with user needs. The implementation of SIPUKTA is expected to improve the efficiency, structure, and transparency of the UKT Tahfidz adjustment process at UIN Ar-Raniry.

OPEN ACCESS

ARTICLE HISTORY
Received: 25 April 2025
Revised: 29 May 2025
Accepted: 8 June 2025
Published: 10 June 2025

KEYWORDS
Information System, UKT Tahfidz, Laravel, Waterfall, SIPUKTA.

Corresponding Author:

Kaisa Zakia
Universitas Islam Negeri Ar-Raniry Banda Aceh, Indonesia
210705101@student.ar-raniry.ac.id

Introduction

Fair Single Tuition Fee (UKTB) is an education payment system designed to distribute education costs fairly based on students' financial performance. This policy refers to the Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 25 of 2020 concerning Education Cost Standards, which regulates the principle of fairness in determining education costs in the UKTB scheme in higher education and aims to ease the financial burden on students[1]. The reduction in education costs varies depending on a person's economic and financial situation. This program is implemented to make higher education more inclusive and accessible to all levels of society without burdening household budgets excessively. According to the guidelines of the Ministry of Education, Culture, Research, and Technology, the UKTB system has been adopted by various universities in Indonesia to ensure equitable distribution of education

funding[2]. The determination of UKT (Single Tuition Fee) is based on economic evidence. The process of determining UKT for new students usually relies on evidence of the guarantor's financial condition, such as pay slips, profit and loss statements, and other related documents[3]. This system aims to objectively assess the financial capabilities of students' parents. However, this method has several limitations, including the potential for data inaccuracy due to file manipulation and inadequate information. Therefore, periodic assessments are often needed to review the existing UKT categories to ensure fair payments.

The UKT adjustment process for Tahfidz students at UIN Ar-Raniry is outlined in the official guidelines based on the Chancellor's Decree on Recipients of UKT Adjustments at UIN Ar-Raniry, Number: 5531/Un.08/B.II/Kp.00.4/08/2024[4]. This adjustment applies to tuition fees for students who have memorized the Qur'an (Tahfidz) at UIN Ar-Raniry Banda Aceh for the 2024/2025 academic year. This program is implemented at the beginning of the odd semester as a form of university appreciation for students who have memorized the Qur'an[5]. This policy aims to ease the burden of costs for students who have demonstrated commitment and success in the religious field. The adjustment process takes into account the level of memorization and other achievements, so that students who meet the criteria can receive a reduction or adjustment to UKT.

Previously a manual process, Google Forms is now used for the Tahfidz UKT Adjustment Registration Process. Although easy to use, this method has significant limitations in terms of data integration and tracking. The data generated from this method varies over time, making data management inefficient and making it difficult to review and track registrant history over the years. The use of Google Forms also complicates the integration of ongoing UKT reconciliation data, increasing the potential for administrative errors and data redundancy. Another challenge in the Tahfidz UKT adjustment registration process is the inability of students to print exam cards independently. This adds to the burden on administrative staff, who must manually process and print exam cards for each registrant. This process requires additional time and resources, which can be saved if a more automated and independent system is available. To overcome these limitations, it is necessary to develop an information system that can manage the Tahfidz UKT registration process more efficiently. This system is expected to make it easier for students to register, check registration status, and print exam cards independently. By using rapid development techniques such as the waterfall model and robust frameworks such as Laravel, the development of this system can be done iteratively and involve user feedback[6]. This integrated system is expected to store data in a structured manner and facilitate the management of UKT registration and coordination of Tahfidz students at UIN Ar-Raniry.

Methods

This study uses a software engineering approach with a Waterfall system development model consisting of the stages of needs analysis, system design, implementation, and testing [7]. The Waterfall method was chosen because it provides a systematic and structured workflow, which is in line with the needs of developing a stable and well-documented web-based UKT adjustment information system. The development process is carried out through four stages of the Waterfall method as follows:

- Needs Analysis: This stage is carried out through interviews with the Head of the Academic Division to collect functional and non-functional needs for the Tahfidz UKT adjustment system. The results of this analysis are the basis for designing features such as self-registration, memorization verification, and automatic exam card creation. • Design: System design utilizes the Unified Modeling Language (UML), a multifunctional visual language used to describe, visualize, develop, and document a system. UML facilitates the understanding, design, configuration, maintenance, and management of system-related information. This stage involves creating Use Case Diagrams, Activity Diagrams, Sequence Diagrams, Class Diagrams, and Entity Relationship Diagrams (ERD). This design maps the workflow, entity relationships, and logical structure of the system visually and structurally[.
- Implementation: The programming languages and technologies used are Hypertext Markup Language (HTML), Hypertext Preprocessor (PHP), Bootstrap, Cascading Style Sheets (CSS), JavaScript, and jQuery[10]. The system is implemented as a web-based application using the Laravel framework. The system developed is named SIPUKTA (UKT Tahfidz Adjustment System) and consists of three types of user accounts: admin, tester, and student.
- Testing: System testing is carried out using the black-box testing method, which evaluates each function based on its output without checking the internal code[11]. The features tested include login, registration, dashboard, submission, memorization assessment, and report generation.

Result

The development of the UKT Tahfidz Adjustment Information System at the State Islamic University (UIN) Ar-Raniry Banda Aceh using the Waterfall method has resulted in a structured and efficient platform. This system includes several main modules, namely student registration, memorization verification by examiners, UKT adjustment by administrators, and reporting.

The implementation results show that the system successfully automated the UKT adjustment process that was previously done manually, reducing administrative errors and speeding up verification time. Functional testing confirmed that all features, such as

memorization data input, examiner assessment, and report generation, work as intended. In addition, the user-friendly interface makes it easier for students, examiners, and administrators to access the system.

Thus, this system not only improves data accuracy but also enhances transparency in the UKT adjustment process based on Qur'an memorization achievements.

1. Implementation

1.1 Authentication Features

a. Multi-User Login Interface

The multi-user login interface serves as the entry point for users to access the SIPUKTA system. Users can enter their NIK/NIM/NIP and password to log in. The option *Don't have an account? Register* allows new users to sign up if they don't already have an account. This interface ensures that only registered and verified users can access the information or services within the system.

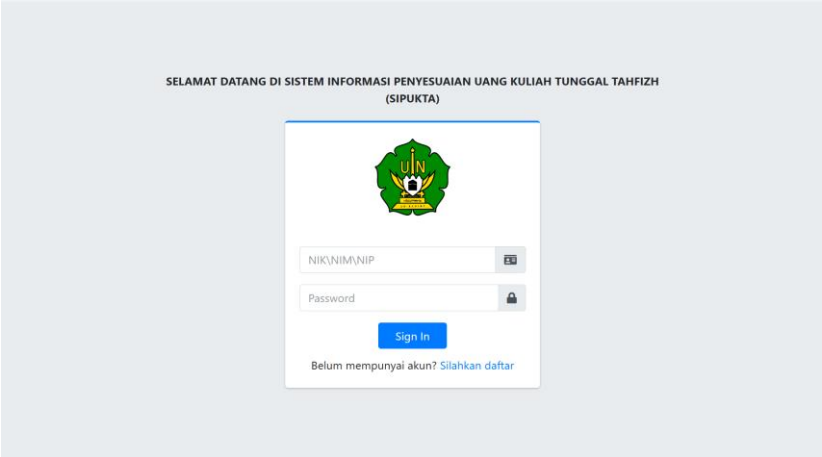

Figure 1. 1Multi-User Login Interface

b. User Registration Interface

The registration interface is designed for new users to create an account in the SIPUKTA system. Users can enter their NIM and password to register, allowing them to access the tuition adjustment services. The option *Already have an account? Login* provides easy access for users who are already registered. This page ensures that every user has a verified identity before using the available features.

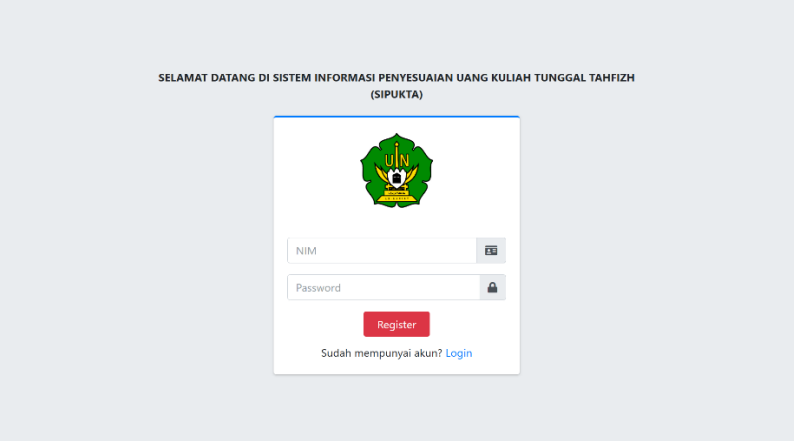

Figure 1. 2 User Registration Interface

1.2 Admin Features

a. Admin Dashboard Interface

The admin dashboard page serves as the control center for managing the SIPUKTA system. This interface displays summarized data such as the number of users, participants, and examiners, allowing the admin to quickly access important information.

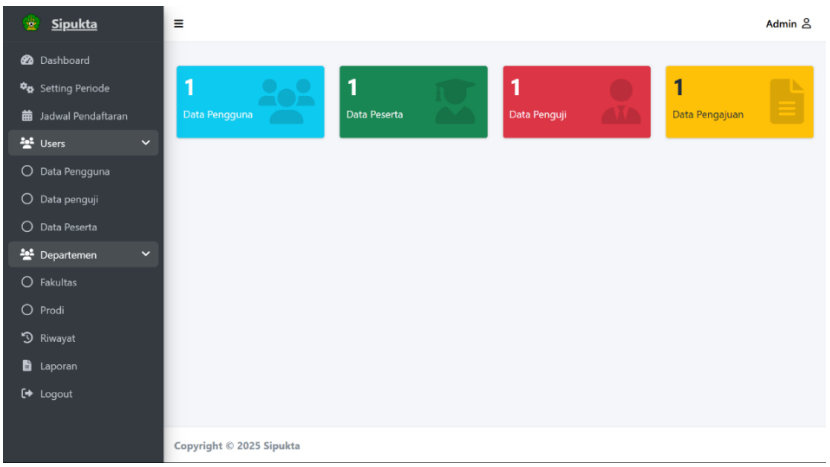

Figure 1. 3 Admin Dashboard Interface

b. Period Settings Interface

The Period Data page is designed to assist the admin in managing and monitoring the available periods within the SIPUKTA system. The admin can view the list of registered periods, edit existing ones, and add new periods when needed.

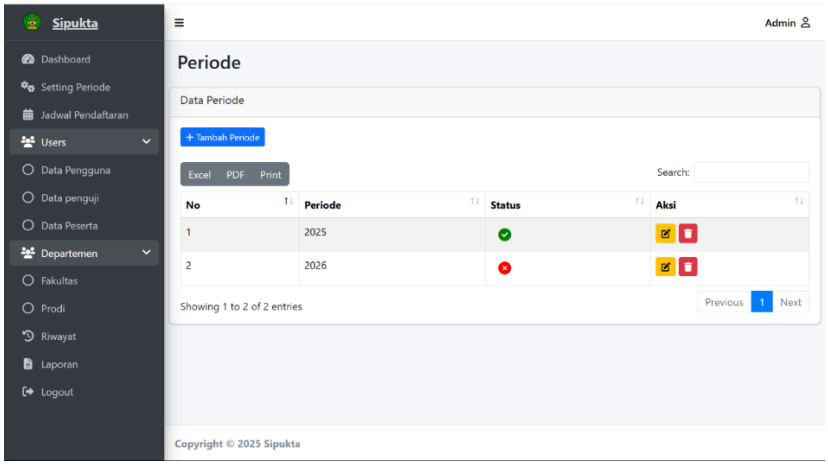

Figure 1. 4 Period Settings Interface

c. Activity Schedule Interface

The Activity Schedule page functions as an information hub for admins to monitor and manage the academic timeline within the SIPUKTA system. The admin can view schedules such as Registration, Card Printing, and Exams along with their respective timeframes. The *Update* button allows the admin to adjust the schedule when changes occur, ensuring that all activities are well-planned and that participants receive the latest information.

Figure 1. 5 Activity Schedule Interface

d. User Data Interface

The User page functions as the main center for managing user data in the SIPUKTA system. The admin can view the list of registered users, including information such as Name, Username, and Role. The admin can also edit existing users or add new users when necessary.

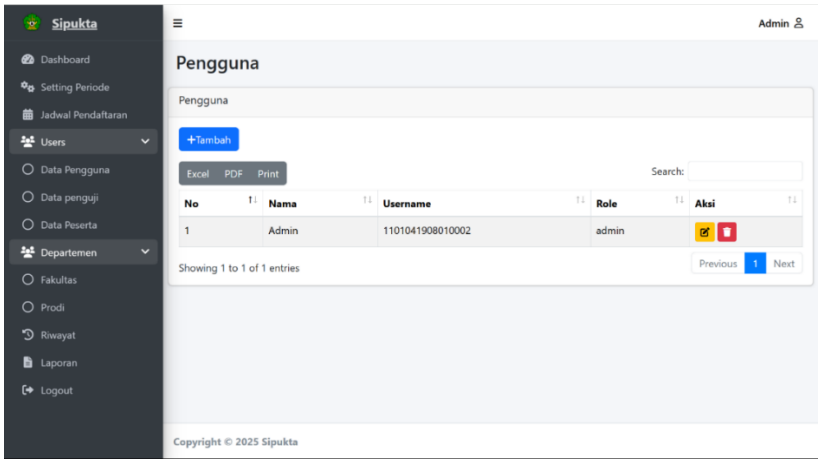

Figure 1. 6 User Data Interface

e. Examiner Data Interface

The Examiner page serves as the main center for managing examiner data in the SIPUKTA system. The admin can view the list of registered examiners, including details such as NIK, Name, and Email. The admin can edit existing examiners or add new ones if needed.

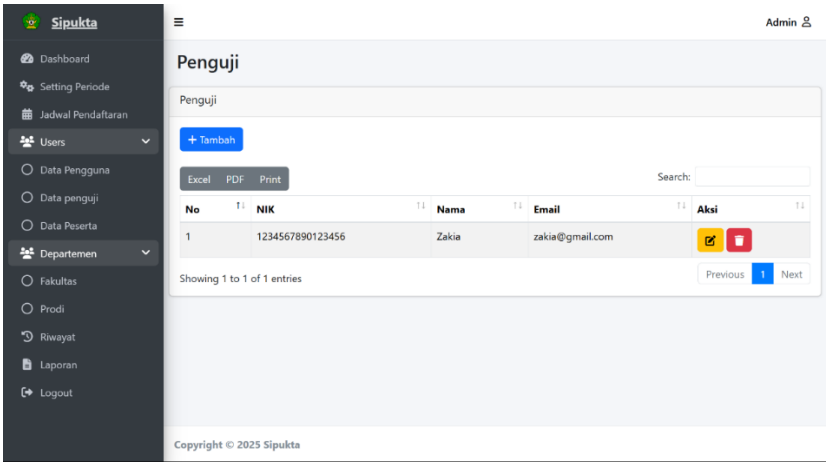

Figure 1. 7 Examiner Data Interface

f. Participant Data Interface

The Participant page serves as a monitoring center for admins to manage participant data within the SIPUKTA system. Admins can view detailed information such as NIM, Name, Phone Number, List of Juz, certification letters, submission status, and actions. In the action column, there are three buttons to input examiner data for a participant, validate the submission, or reject the submission if it does not meet the requirements.

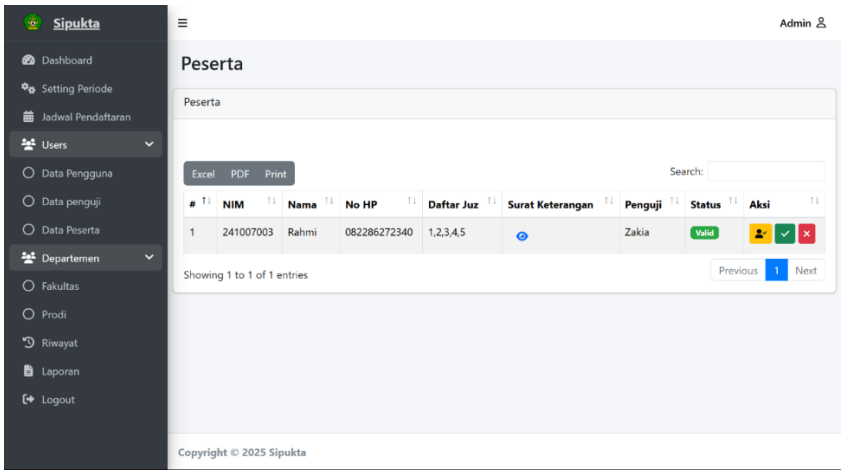

Figure 1. 8 Participant Data Interface

g. Faculty Data Interface

The Faculty page serves as the main center for managing faculty data in the SIPUKTA system. Admins can view the complete list of faculties along with their respective codes. The Action column with an Edit option helps the admin update faculty information when needed.

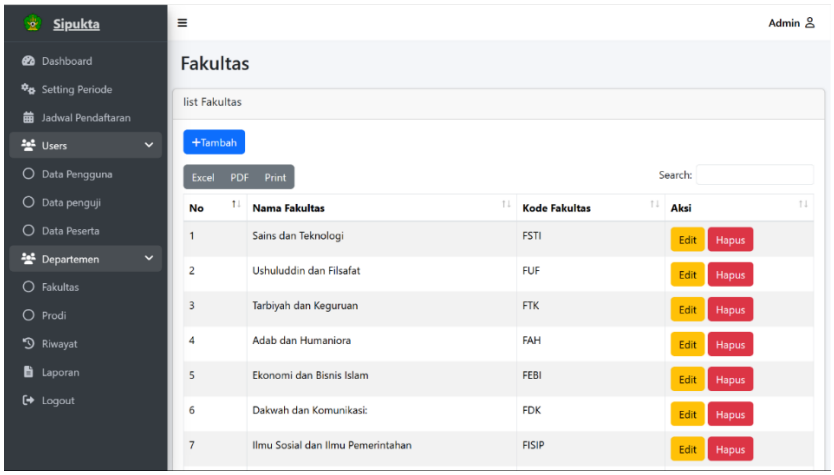

Figure 1. 9 Faculty Data Interface

h. Study Program Data Interface

The Study Program List page functions as the main management interface for study programs in the SIPUKTA system. Admins can view a complete list of study programs along with details such as Program Name, Program Code, and Associated Faculty. The Add, Edit, and Delete buttons in the Action column allow for the modification or removal of existing study program data.

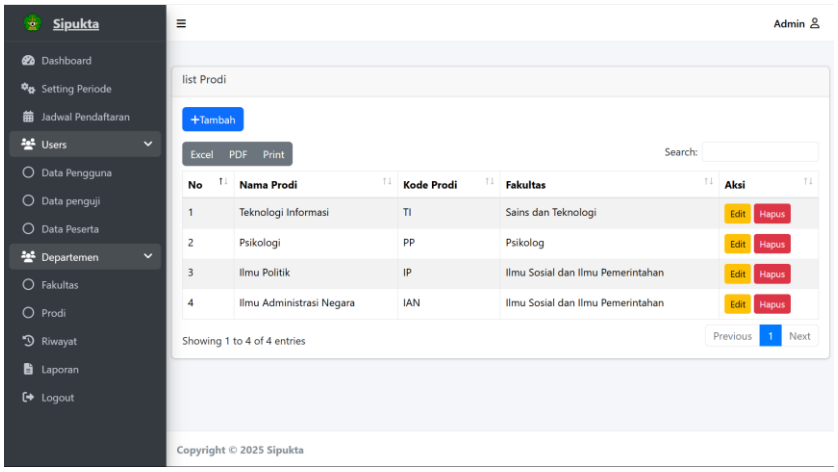

Figure 1. 10 Study Program Data Interface

i. Participant Submission History Interface

Halaman Riwayat Pengajuan berfungsi sebagai pusat rekam jejak untuk melacak status pengajuan peserta dalam sistem SIPUKTA. Admin dapat melihat detail seperti NIM, Nama, Juz yang dihafal, UKT Awal, Hafalan Juz, UKT Baru, dan Status (contoh: Lulus atau Belum sesuai kriteria). Tabel yang tersusun rapi membantu admin mengevaluasi perkembangan peserta, memverifikasi kelulusan, serta memantau penyesuaian UKT berdasarkan pencapaian hafalan.

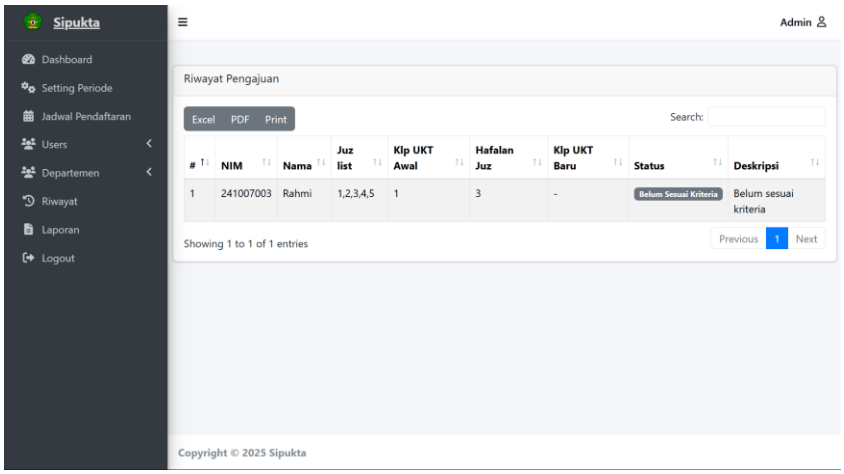

Figure 1. 11 Participant Submission History Interface

j. Report Printing Interface

The Report page functions as the official document generation center in the SIPUKTA system. Admins can select the period and type of report, such as SK Report or Graduation Report, according to administrative needs.

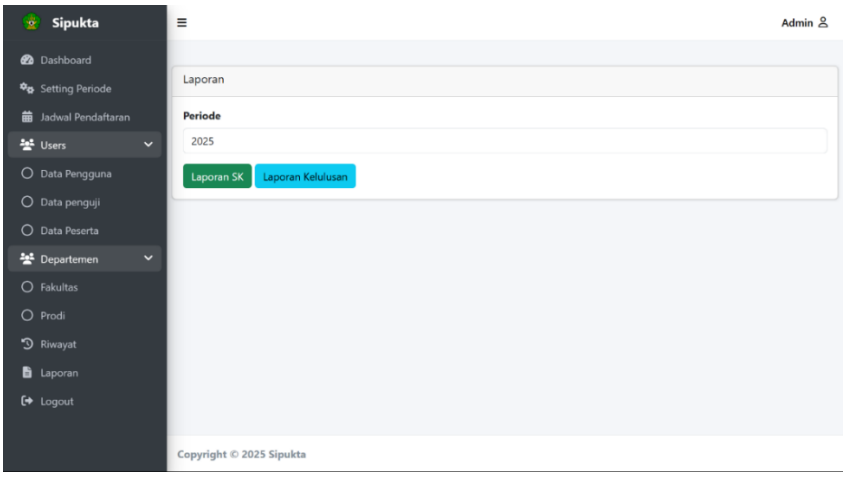

Figure 1. 12 Report Printing Interface

1.3 Officer Features

a. Examiner Dashboard Interface

The Examiner Dashboard page provides a quick overview of tahfizh exam activities for the examiner. This interface displays a summary of participant data such as Total Participants, Participants Not Yet Examined, and Participants Already Examined, helping the examiner understand their workload and assessment progress in real-time.

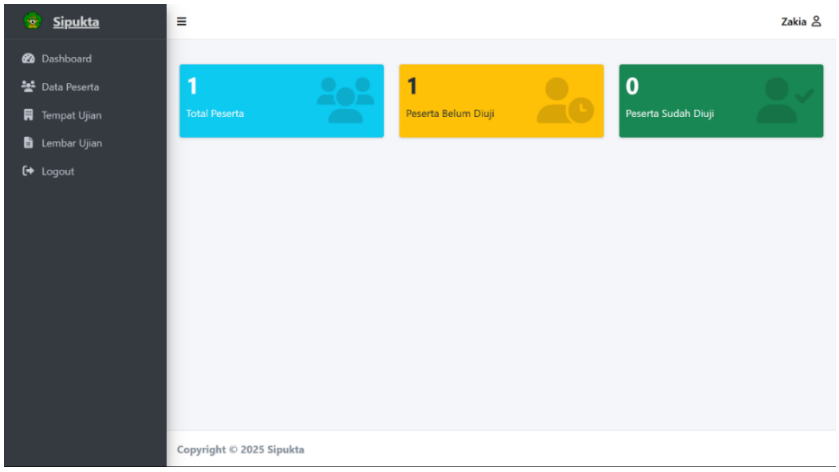

Figure 1. 13 Examiner Dashboard Interface

b. Participant Data Interface

The Participant Data page serves as an interface for examiners to access detailed information on tahfizh exam participants. Examiners can view data such as Student ID (NIM), Name, Phone Number, List of Memorized Juz, and Exam Location, which are needed for the assessment process.

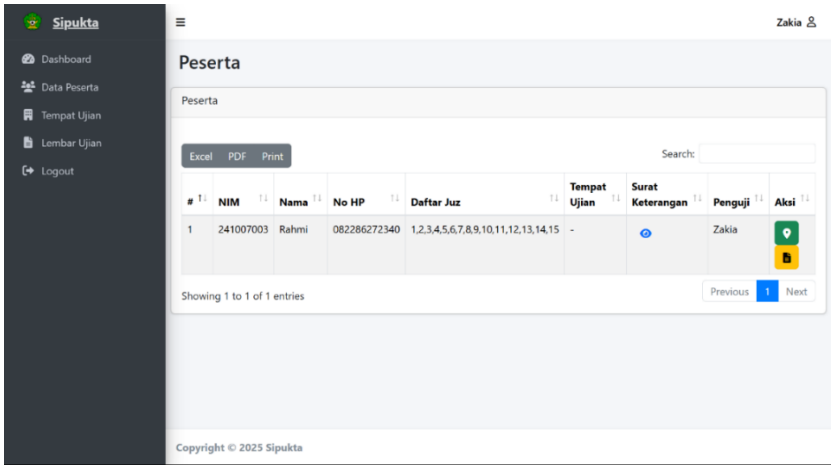

Figure 1. 14 Participant Data Interface

c. Participant Exam Location Input Interface

The Exam Location Input page facilitates examiners in scheduling the time and location for tahfizh exams. Examiners can set the Exam Date according to the system-defined period. Clear date restrictions help ensure consistency in the exam schedule.

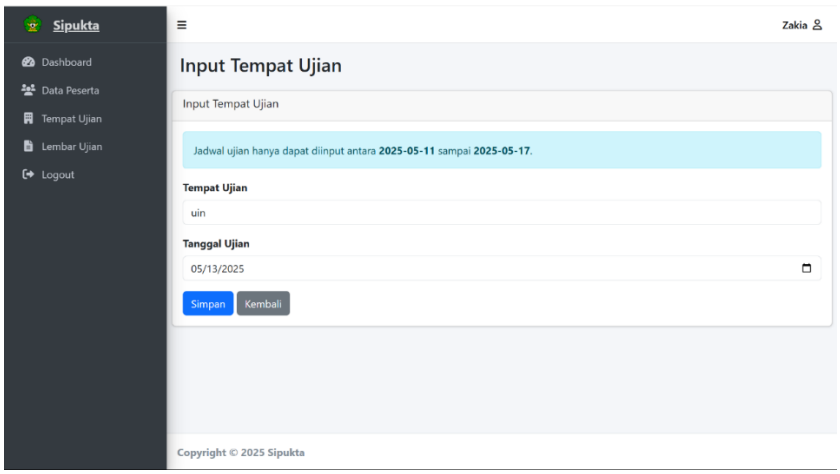

Figure 1. 15 Participant Exam Location Input Interface

d. Participant Score Input Interface

The Exam Sheet page functions as an assessment form for examiners to record tahfizh exam results. Examiners can view participant details such as Student ID (NIM), Name, and Total Juz Memorized, and then fill in the number of Juz successfully recited by the participant during the exam.

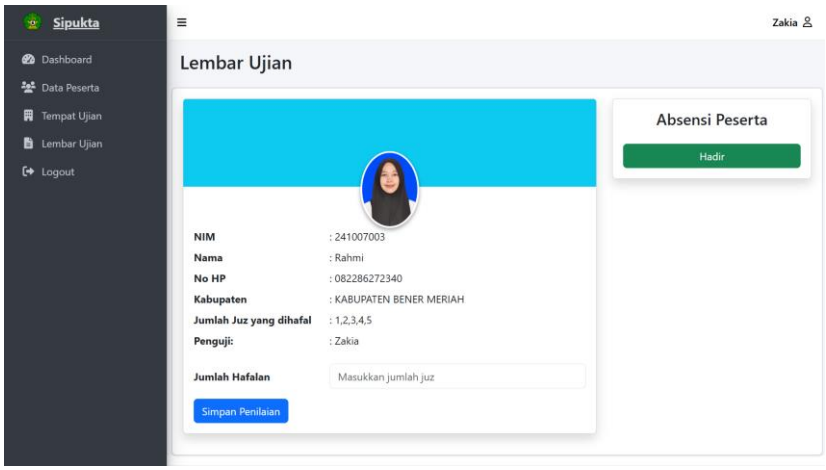

Figure 1. 16 Participant Score Input Interface

1.4 Student Features

a. Student Dashboard Interface

The Student Dashboard page serves as an information center to guide students through the stages of the tahfizh UKT adjustment process. This interface displays the complete workflow, starting from filling out personal data, registration, to the implementation of the new UKT. It helps students understand the necessary steps. With a clear division of responsibilities between students, staff, and examiners, this dashboard ensures transparency and helps students prepare themselves according to the schedule set by the SIPUKTA system.

Figure 1. 17 Student Dashboard Interface

b. Student Biodata Interface

The Biodata page helps students complete or update their personal data in the SIPUKTA system. Students can enter information such as Name, National ID Number (NIK), Phone Number, Faculty, and Study Program, as well as address details from Province to Village. The Profile Photo field allows the upload of supporting

documents. By filling out this form, students ensure that their data is accurate and up to date, which is necessary for the tahfizh UKT adjustment process.

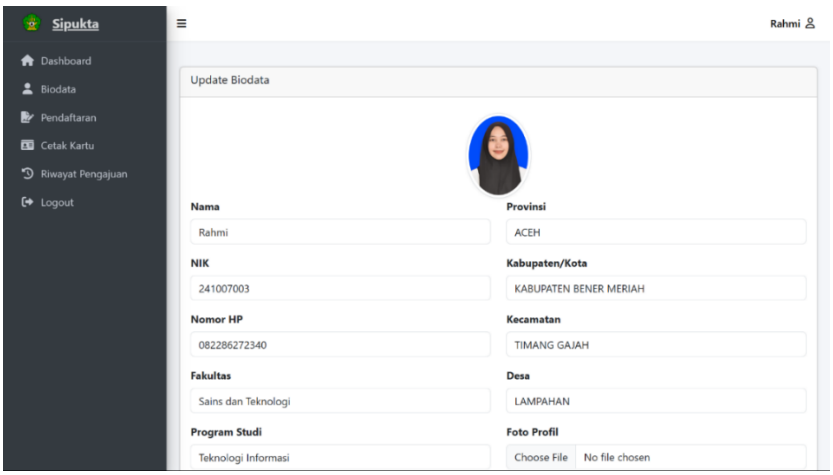

Figure 1. 18 Student Biodata Interface

c. Registration Interface

The Registration page facilitates students in submitting the memorized parts of the Qur'an to be tested for UKT adjustment. Students can select the Juz (1–30) they have memorized from the available list. The Upload Certificate section allows students to attach supporting documents in PDF format. The Save button is used to submit the registration data.

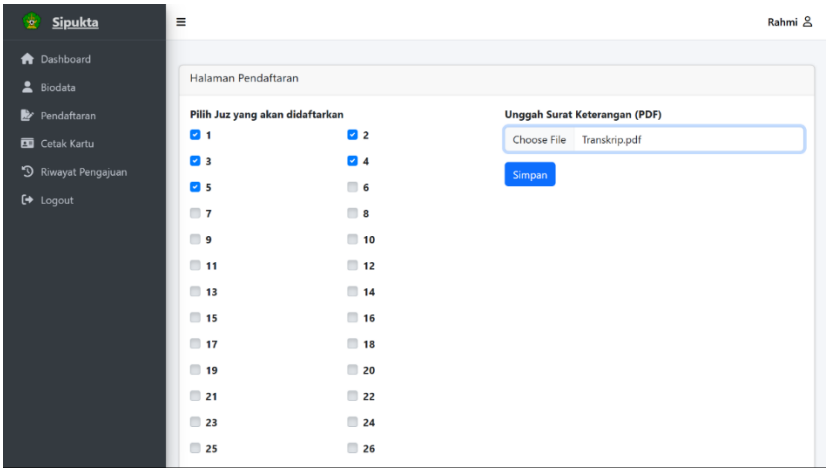

Figure 1. 19 Registration Interface

d. Exam Card Printing Interface

The Exam Card functions as an official document listing student identity and exam information. The card includes details such as Name, Student ID (NIM), Study Program, List of Juz to be tested, and the Exam Date and Location. By printing this card, students have valid proof of registration to participate in the tahfizh exam.

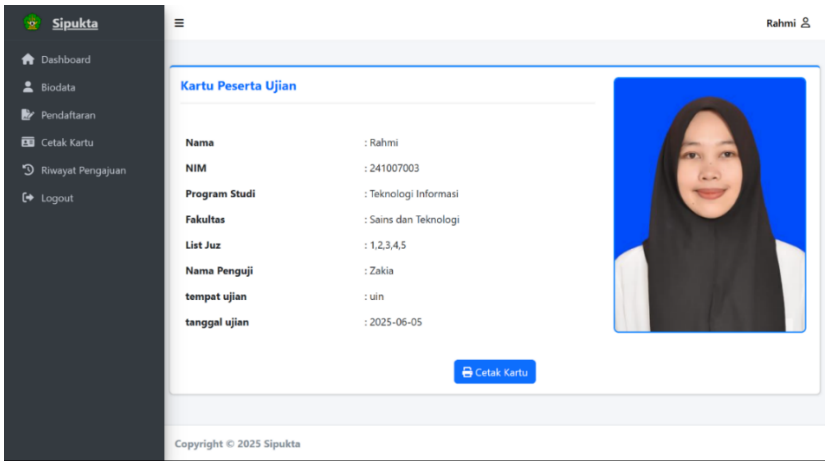

Figure 1. 20 Exam Card Printing Interface

e. Submission History Interface

The Submission History provides students with a summary of their UKT adjustment application status based on Qur'an memorization. Students can view details such as NIM, Name, Memorized Juz, Initial UKT, and Submission Status. The Examiner column (e.g., Zakia) shows the person responsible for evaluation. This information helps students understand the ongoing administrative process.

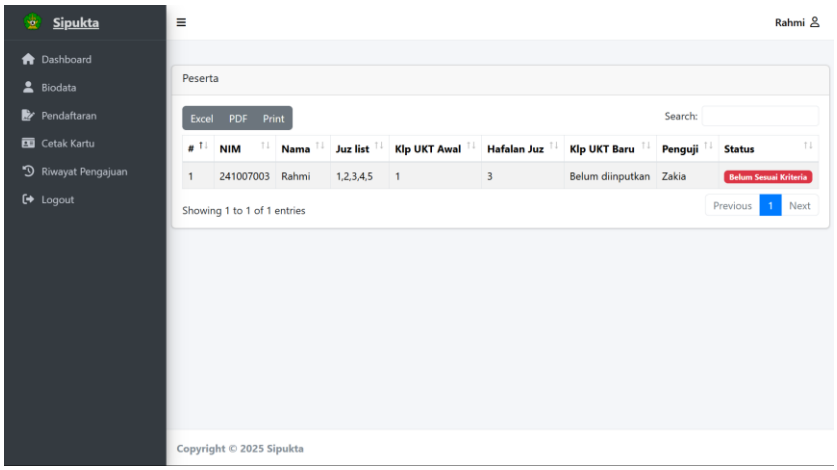

Figure 1. 21 Submission History Interface

2. Testing

Black box testing was carried out to verify the system's functionality without considering the internal code structure, focusing instead on the conformity of outputs to the given inputs. This testing covered all major features such as student registration, memorization input by the examiner, and UKT adjustment processing by the admin. Test scenarios were designed based on user needs, including: authentication testing, admin feature testing, examiner feature testing, and participant feature testing.

Discussion

The development of the information system for the Tahfidz single tuition fee adjustment at UIN Ar-Raniry demonstrated the effectiveness of the Waterfall method in structured software development. The linear and sequential approach with clearly defined phases provided a framework that facilitated efficient management of the project scope and schedule (Pressman, 2014). This method was appropriate given the well-defined requirements of the tuition fee adjustment system.

The implementation of the system improved the accuracy and efficiency of tuition fee adjustments compared to the previous manual processes. Automated calculations significantly reduced human error, thereby enhancing the precision of financial administration (Somerville, 2016). This aligns with studies showing that information systems contribute to operational efficiency in educational institutions (Alalwan et al., 2019).

The system's user interface design focused on simplicity and ease of use, which was important for adoption by administrative staff who may not possess advanced IT skills. User-centered design principles were applied during the design phase, resulting in positive user feedback during testing (Nielsen, 1994). This finding supports previous research emphasizing the role of usability in system acceptance (Davis, 1989).

The rigor and thorough documentation of the Waterfall method ensured traceability and accountability at every stage of development. This facilitated early detection of requirement mismatches and improved communication among stakeholders (Royce, 1970). These outcomes reflect traditional software engineering best practices essential in academic projects (Sommerville, 2016).

Despite its advantages, the Waterfall method showed limitations, particularly in handling changes in requirements. Once development proceeded to the coding phase, accommodating changes became difficult (Boehm, 1988). This underscores the importance of thorough initial requirements analysis in systems expected to have minimal changes, such as tuition fee adjustments.

System integration testing confirmed that the application worked reliably within the existing financial and student information systems. This integration reduced redundant data entry and maintained data consistency across applications (Bass et al., 2012). This finding aligns with best practices in system interoperability in educational environments (Chen et al., 2018).

The implementation phase revealed that stakeholder engagement was critical for successful deployment. Involving administrative staff early in requirements gathering

and system evaluation helped address practical challenges and increased user satisfaction (Avison & Fitzgerald, 2006). This is consistent with participatory design theories that highlight the benefits of user involvement.

Data security and privacy were prioritized given the sensitivity of student financial data. The system implemented role-based access controls and encryption to protect data, in compliance with institutional standards and legal regulations (Stallings, 2013). These security measures are essential to build trust and ensure compliance in educational information systems.

Future development could consider more flexible and adaptive methodologies like Agile to better accommodate changes in tuition fee policies. Agile practices promote iterative development and continuous stakeholder feedback, which would be beneficial in dynamic environments (Beck et al., 2001). However, for the current context, the Waterfall method provided a solid foundation for the initial system development.

This project demonstrates that a well-structured information system using conventional software engineering methods can significantly contribute to administrative efficiency and decision-making in educational institutions. The successful implementation at UIN Ar-Raniry can serve as a model for other institutions seeking to automate their financial processes (Laudon & Laudon, 2016).

Conclusion

Based on the research conducted, the development of the Tahfidz UKT Adjustment Information System at UIN Ar-Raniry using the Waterfall method and Laravel framework has successfully addressed the formulated research problems. The system is capable of automating the UKT adjustment process based on Qur'an memorization, replacing the previous manual system which was prone to errors and inefficiencies. The Waterfall stages requirements analysis, design, implementation, testing, and maintenance have proven effective in producing a structured system that meets user needs. Features such as memorization registration, examiner verification, and report generation function properly, enhancing data accuracy, transparency, and the efficiency of administrative processes. Thus, the system not only fulfills the development objectives but also provides a practical solution to the problems faced by students, examiners, and campus administration.

References

Kementerian Pendidikan dan Kebudayaan. (2020). Permendikbud Nomor 25 Tahun 2020.

Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi. (2024). Permendikbudristek Nomor 2 Tahun 2024.

Ramadhan, N. S., Nursafitri, W. N., & Sekolah Tinggi Manajemen Informatika dan Komputer Negeri Subang. (2024). Analisis klasifikasi UKT mahasiswa berdasarkan tingkat penghasilan orang tua menggunakan algoritma C4.5. INVENTOR: Jurnal Inovasi dan Tren Pendidikan Teknologi Informasi, 2(1), 3026–3190. https://doi.org/10.37630/inventor.v1i3.1248

Kementerian Pendidikan dan Kebudayaan. (2024). Pengumuman penyesuaian UKT.

Kementerian Pendidikan dan Kebudayaan. (2024). Pembukaan kembali pembayaran UKT mahasiswa pada semester ganjil tahun ajaran 2024/2025.

Wahid, A. A. (n.d.). Analisis metode waterfall untuk pengembangan sistem informasi. Sekolah Tinggi Manajemen Informatika dan Komputer Sumedang. Retrieved from https://www.researchgate.net/publication/346397070

Aji, S., & Pratmanto, D. (2021). Sistem informasi inventory barang menggunakan metode waterfall. Retrieved from http://ejournal.bsi.ac.id/ejurnal/index.php/ijse

Satria Wahono, R. (2003). Retrieved from http://romisatriawahono.net

Satria Wahono, R. (2003). Retrieved from http://romisatriawahono.net

Syarif, M. (n.d.). Waterfall sebagai model pengembangan sistem persediaan apotek berorientasi objek. Jurnal Teknologi Informasi, 6(1).

Pratama, S. D., & Dadaprawira, M. N. (2023). Pengujian black box testing pada aplikasi Edu Digital berbasis website menggunakan metode equivalence dan boundary value. Jurnal Teknologi Sistem Informasi dan Sistem Komputer TGD, 6(2), 560–569. Retrieved from https://ojs.trigunadharma.ac.id/index.php/jsk/index