

Analysis And Design Of A Website-Based Information System For Educational Development Contribution Payments Smks Yapenap

Ahmad Faiz Muqtasid

UIN Syarif Hidayatullah Jakarta

Jl. Ir. H. Juanda No. 95, Ciputat Timur, Tangerang Selatan, Banten, Indonesia

email : faizmuqtasidahmad@gmail.com

ABSTRACT

SMKS Yapenap still manages tuition fee payments manually using spreadsheets, which increases the risk of recording errors and slows down report preparation. This study aims to analyze and design a website-based tuition fee payment information system to improve operational efficiency and data accuracy. The methodology used is Rapid Application Development (RAD) with Unified Modeling Language (UML) modeling. System requirements analysis is also supported by the PIECES framework to evaluate performance and service aspects. The results of the study are a system design with a centralized database that enables real-time data management. An automatic validation feature is designed to minimize human error and speed up the transaction process. In addition, this portal provides transparency for parents in monitoring payment status independently. In conclusion, the RAD method is effective in producing a professional and accountable financial management solution for SMKS Yapenap.

Keywords – Information system, SPP, RAD, UML

1. Introduction

The use of information systems is a key element in improving operational effectiveness in various sectors, including education. An information system is an integrated system that combines information technology and organized procedures to provide useful information for users or organizations. This system supports business activities by collecting, processing, and distributing data to facilitate operations and management within the organization.[1].

Accurate financial management is a crucial element in supporting smooth operations in educational institutions such as SMKS Yapenap. However, at present, the administrative process for SPP payments at the school is still carried out conventionally using simple spreadsheet applications and physical bookkeeping. This manual method often triggers various obstacles, ranging from inaccurate calculation of student arrears, slow transaction data search, to the risk of losing information due to damage to physical documents.

As a solution to these problems, digital transformation is needed through the design of a Website-based payment information system [2,3]. This study proposes system development with the Rapid Application Development (RAD) method to ensure a fast creation process that is in accordance with user needs [4]. The main objective of this design is to create an efficient, transparent administrative system that is capable of providing real-time financial reports to support school governance accountability [5].

2. Research Method

This research methodology implements systematic stages consisting of data collection through direct observation and literature study. System development is carried out using the RAD method which includes three main phases: Requirements Planning, Workshop design, and Implementation [6]. However, this study is limited to system analysis and design without covering the implementation stage. For business process modeling and data structure, Unified Modeling Language (UML) is used which includes Use case Diagrams, Activity Diagrams, Sequence Diagrams, and Class Diagrams [7,8]. Requirements analysis is evaluated using the PIECES framework to ensure that the proposed system covers optimal performance to service aspects [9]. The stages of the research method carried out were as follows:

2.1 Data Collection Method

This study was conducted through direct observation of the operational procedures at SMKS YAPENAP to comprehend the tuition (SPP) payment workflow, identify constraints inherent in the current system, and formulate appropriate solutions.

2.2 Literature Review

This literature review was performed by examining prior research or similar scholarly works as primary reference sources to establish a theoretical foundation closely aligned with the Rapid Application Development (RAD) methodology [10-14].

2.3 Requirements Analysis

This requirements analysis aims to ensure that the features developed within the web-based information system provide solutions that strictly align with the school's requirements. The PIECES analysis is utilized to assist developers in evaluating the effectiveness of both current and planned systems, encompassing six primary evaluation factors: Performance, Information, Economy, Control, Efficiency, and Service.

2.4 System Development Method

The proposed system is designed utilizing the Rapid Application Development (RAD) methodology, supported by Unified Modeling Language (UML) to model data flows and business processes in a structured manner. RAD is an incremental software development process model that emphasizes an extremely short development cycle[15]. This methodology was developed to address the limitations of traditional models, which often require extensive documentation phases before the software is ready for deployment, through several stages: Requirements Planning and Workshop Design [16]. Requirement Planning, this stage serves as the initial step where users and system analysts collaborate to define the primary objectives of the application or system to be developed. Workshop design, this stage is a core component of the RAD method, where technical aspects and user requirements converge through an iterative design process.

UML is a standardized language used for defining, visualizing, constructing, and documenting software artifacts [17-19]. UML is not merely a collection of diagrams but a tool for illustrating complex system structures to ensure clarity among all members of the development team. Commonly utilized UML diagrams include Use Case diagrams, Activity diagrams, Sequence diagrams, and Class diagrams [19]. Use case Diagram, this diagram provides information regarding the system's capabilities without detailing the technical specifics of its operations. Activity Diagram, this diagram is comparable to a flowchart, but includes additional features to illustrate processes occurring simultaneously. Sequence Diagram, this diagram demonstrates the communication methods between objects by sending messages

to execute specific functions. Class Diagram, this diagram presents more than just a list of classes, it also encompasses attributes (data), methods, and the relationships between different classes.

3. Results

The analysis of issues within the manual tuition (SPP) payment system at SMKS Yapenap using the PIECES framework indicates significant operational performance constraints, where student data retrieval from ledgers is time-consuming, leading to long queues. Information quality is frequently inaccurate due to human errors in recording amounts, resulting in balance discrepancies and high economic costs for physical receipts and bookkeeping materials Furthermore, data security risks are elevated because physical documents are susceptible to damage without digital backups, Efficiency is hindered by redundant transaction recording across different media, and service to parents is limited due to a lack of independent, real-time access to payment status information.

A. System Modeling with Use Case Diagram

This Use Case Diagram is designed to illustrate the system's functionality from the user's perspective, involving two primary actors: the Admin and the Parents/Student..

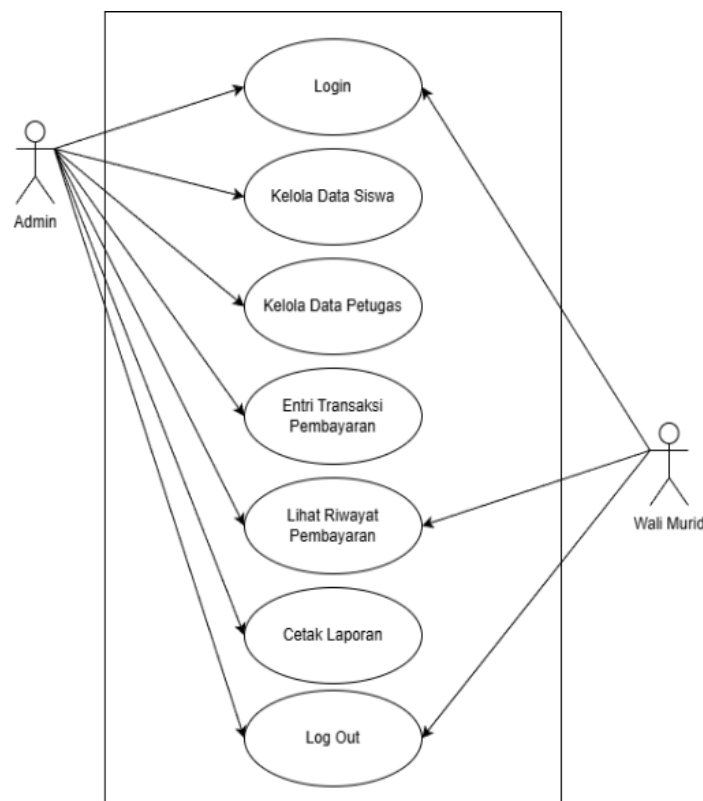


Figure 1. Use Case Diagram

B. System Modeling with Activity Diagram

This Activity Diagram illustrates the Admin's workflow when recording student tuition (SPP) payment transactions. The process begins with the Admin selecting the payment menu and entering the student's NIS to retrieve billing data. The system then displays the student's information and the

outstanding balance. After the Admin enters and saves the payment amount, the system automatically updates the payment status in the database and prints the proof of payment.

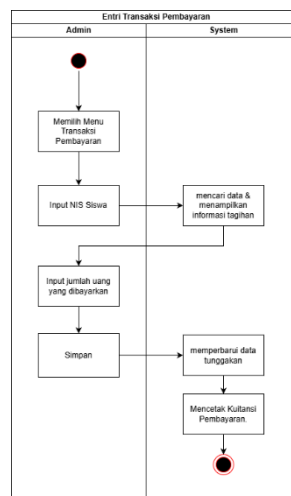


Figure 2. Payment Transaction Activity Diagram

C. System Modeling with Sequence Diagram

This Sequence Diagram illustrates the flow of the tuition (SPP) payment recording process. It begins with the Admin entering the student's NIS in the payment menu (1). The system control searches for billing information in the student and payment tables (2) and displays it on the page (3). The Admin then enters the payment amount and clicks save (4). The system control updates the transaction status in the database (5) and triggers the system to generate a digital receipt (6). This diagram demonstrates the crucial interaction between the Admin, the transaction page, the payment control, and the student and transaction tables.

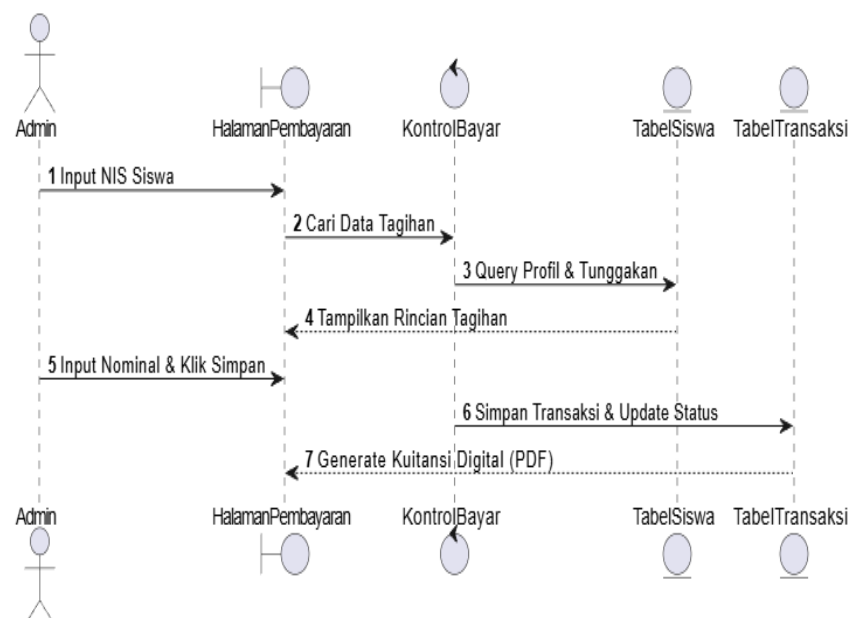


Figure 3. Payment Transaction Sequence Diagram

D. System Modeling with Class Diagram

This diagram illustrates how the system is organized by displaying classes, attributes, methods, and the relationships between objects.

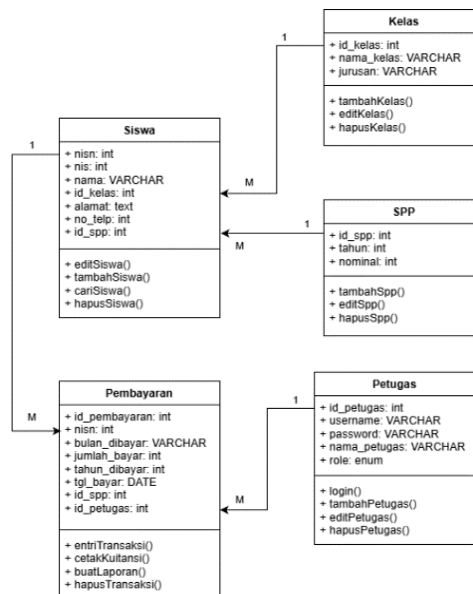


Figure 4. Class Diagram

E. Login Page

The login page serves as the primary access gateway, requiring users to enter a username and password to verify their identity before gaining system access. Beyond the core authentication functionality, this page provides a "Remember Me" option, a password recovery link, and support information to contact the administrator for users who do not yet possess an access account.

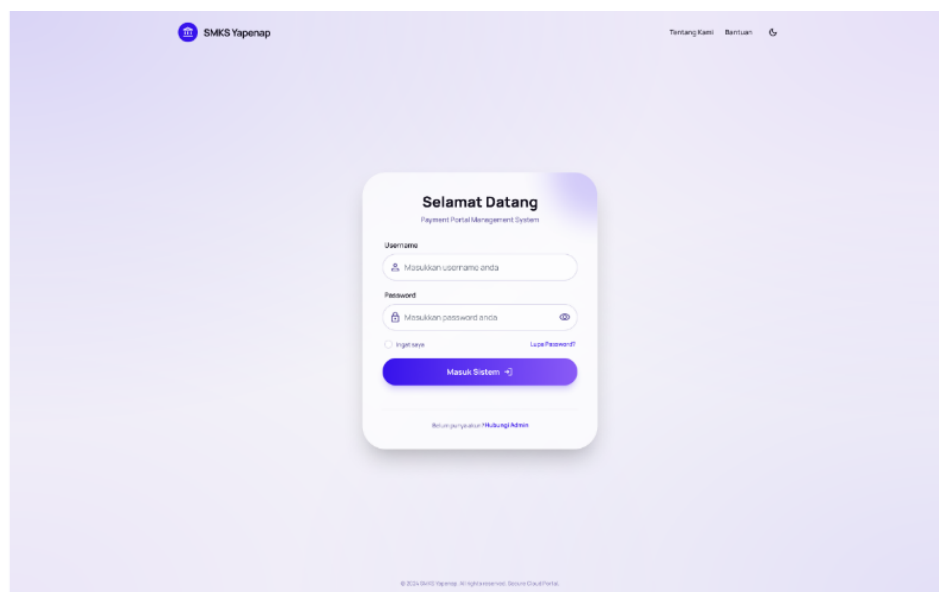


Figure 5. Login Page

F. Dashboard Page

The dashboard page acts as an operational information hub that presents essential statistics instantaneously, such as the total count of active students, financial income for the current day, and a summary of students with outstanding payment arrears. Furthermore, a visualization in the form of a graph showing payment trends over the past six months is provided to monitor fluctuations in school revenue data.

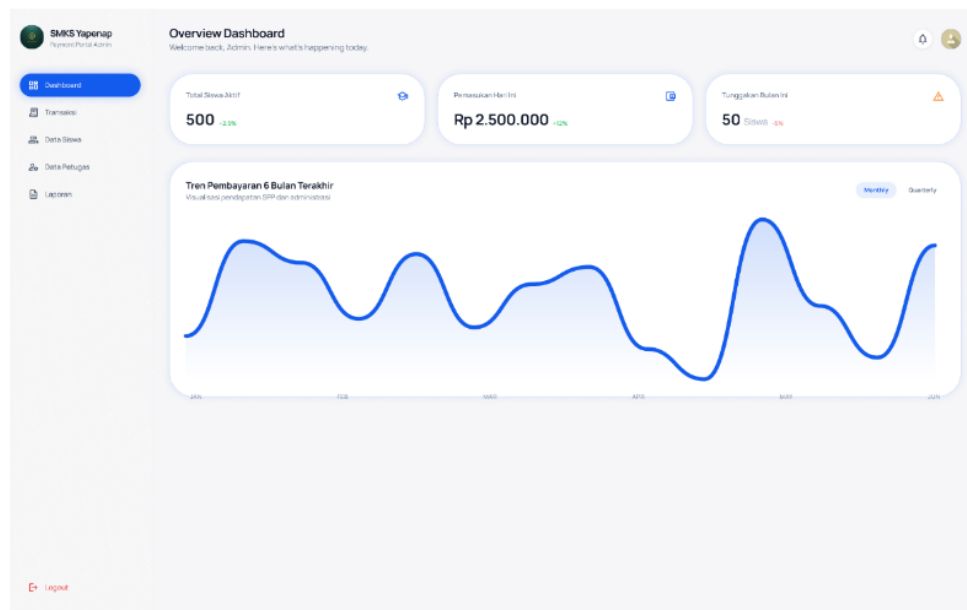


Figure 6. Dashboard Page

G. Student Data Management Page

The student data management page serves as a student database organized in an information table, encompassing data such as the Student Identification Number (NIS), full name, grade level, and major. The administrator can utilize student search features, add new records, and perform data updates or deletions through the provided action column.

NIS	Nama Lengkap	Kelas	Jurusan	Status	Aksi
10210101	Ahmad Zaki	XI	IPA	Aktif	[Edit] [Delete]
10210102	Siti Azzahra	XI	TKJ	Aktif	[Edit] [Delete]
10210103	Budi Santoso	XI	IPA	Aktif	[Edit] [Delete]
10210104	Dewi Lestari	XI	IPA	Aktif	[Edit] [Delete]
10210105	Fajar Ramadhan	XI	TKJ	Aktif	[Edit] [Delete]

Menampilkan 10 dari 10 data siswa

Figure 7. Student Data Management Page

H. Staff Data Management Page

The staff data management page is designed to manage the list of accounts with administrative authority within the system. The information managed includes usernames, full names of the staff, and their respective roles or access levels, complemented by search and new staff addition functionalities.

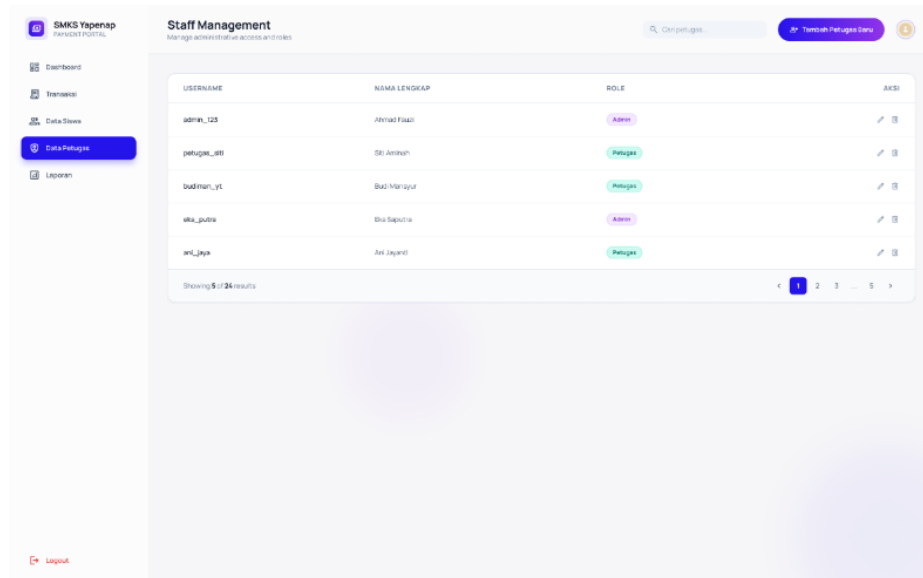


Figure 8. Staff Data Management Page

I. Payment Transaction Page

The payment transaction page facilitates the direct recording of payments by initiating a search via the student identification number to automatically retrieve the student's profile and outstanding balance status. Staff members can select the specific month for payment, manually input the numerical amount, and determine the transaction method either cash or transfer prior to processing the data and generating a digital payment receipt.

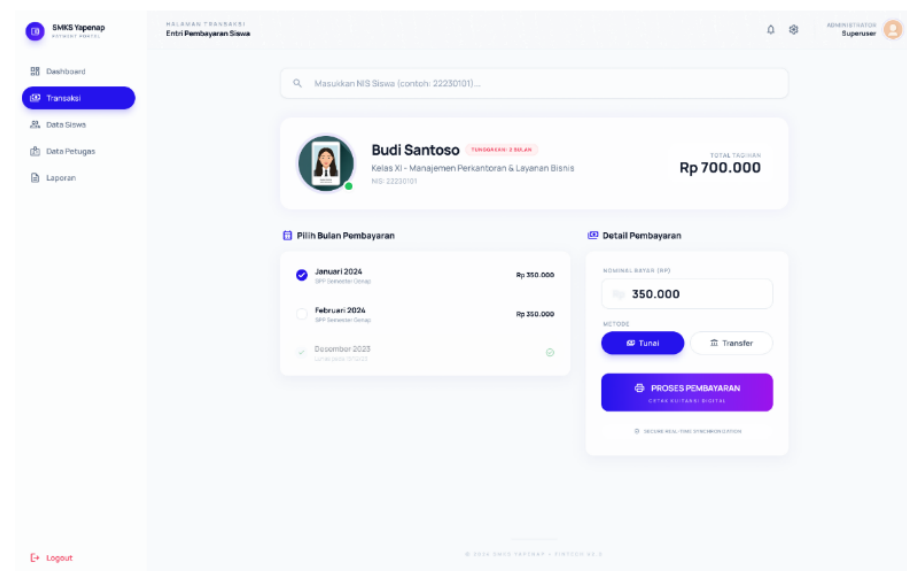


Figure 9. Payment Transaction Page

J. Payment History Page

The payment history page is designed for the user side to monitor monthly settlement status and review details of recent transactions. It features a personal financial report summary that lists the total annual accumulated payments, remaining payment obligations, and information regarding any existing arrears.

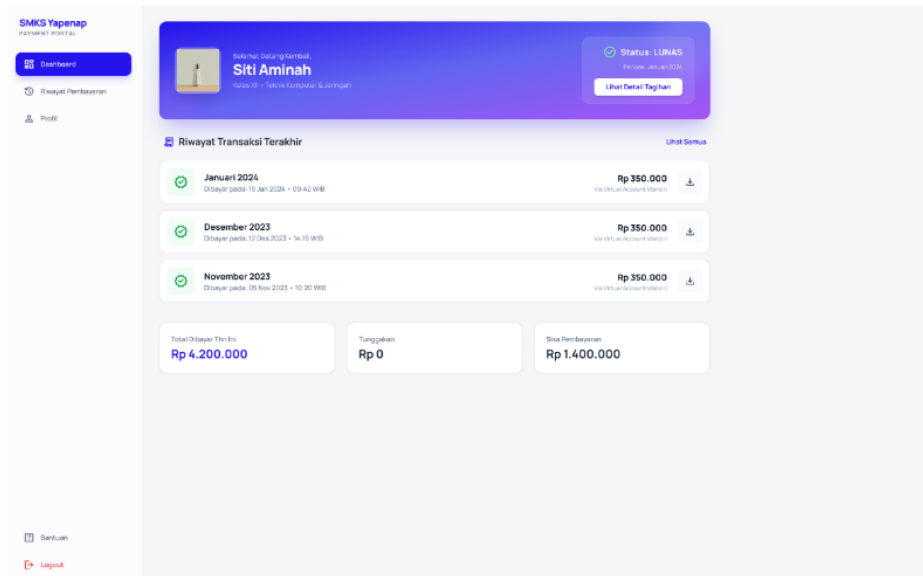


Figure 10. Payment History Page

K. Payment Report Generation Page

The report printing page is utilized for the recapitulation of monthly financial data, featuring filters based on specific months and years to ensure transparency. The system presents the total income for the selected period, provides options to export data into PDF or Excel formats, and displays a systematic preview of student transaction details.

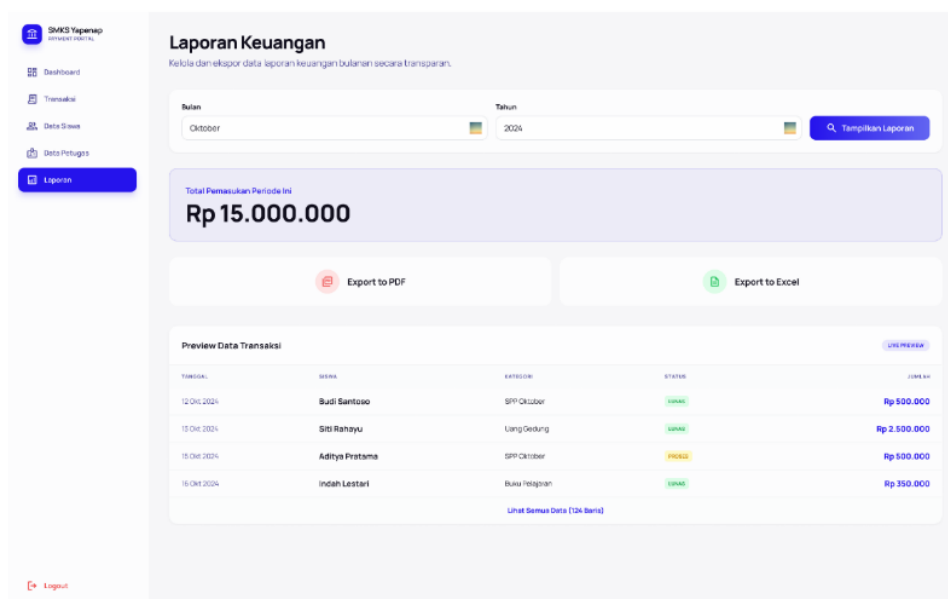


Figure 11. Payment Report Generate Page

L. Logout Confirmation Pop-up

The logout pop-up serves as a security measure before a user terminates an active session by displaying a confirmation prompt to prevent accidental logouts. Users are provided with two courses of action: to cancel the process or to confirm an immediate exit from the system.

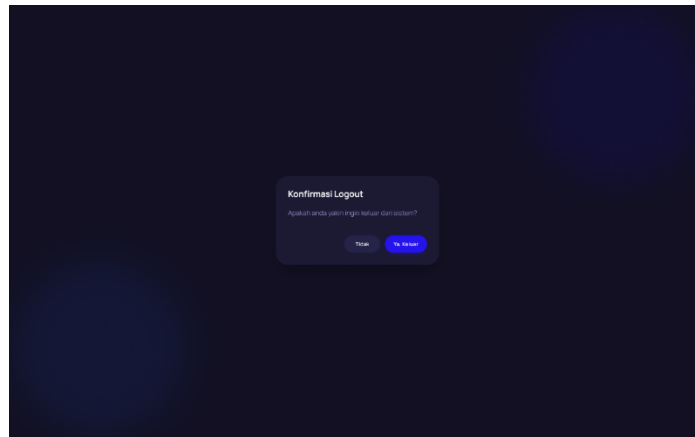


Figure 12. Logout Confirmation Pop-up

4. Conclusion and Recommendations

The website-based tuition fee (SPP) payment information system designed for SMKS Yapenap has successfully replaced the manual Excel-based system by providing real-time data management within a centralized database. Utilizing automatic validation features, the system is capable of minimizing human error, enhancing the efficiency of financial report and digital receipt generation, and providing transparency for guardians to monitor payment statuses independently. Overall, the implementation of the Rapid Application Development (RAD) method in this research provides a practical solution for the school to achieve more professional, transparent, and accountable financial governance in the digital era.

The following recommendations are proposed to enhance the quality of the design and support the future implementation of the system:

1. Implementing Two-Factor Authentication (2FA) for administrator accounts to strengthen security access to school financial records.
2. Integrating the payment system with an SMS Gateway or WhatsApp Auto-responder service to provide automated notifications to guardians regarding billing or validated payment proofs.
3. Conducting intensive training for administrative staff prior to full implementation to ensure mastery of system features and minimize technical obstacles during daily operations.
4. Periodically collecting feedback from guardians and staff to continuously refine the User Interface (UI), ensuring it remains intuitive and accessible via mobile devices.
5. Integrating the tuition payment database with the school's Academic Information System (SIKAD) to establish a more unified and efficient digital data ecosystem.

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