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Website-based School Application Redesign with Design Thinking Method (Case Study: Ezzi School)

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Abstract: Administrative management in schools that are still manual is quite difficult, so it is necessary to adopt technology through a school information system. Ezzi School is a school information system application that makes it quite easy for administrators to manage administration. However, the appearance of the application still has a low level of user satisfaction, and the SUS score is 33, which is in the unacceptable category. Based on these problems, the researchers want to redesign the User Interface and User Experience to improve the user experience, so that the use of applications becomes more optimal. The research process was carried out using the Design Thinking method which has five stages, namely Empathize through interviews and questionnaires to identify needs, Define to define the main problem, Ideate through brainstorming to generate solution ideas, Prototype by making low-fidelity and high-fidelity wireframes developed in the form of a front end, and Testing using the System Usability Scale (SUS) method to measure the success rate of the redesign. The results show a score of 87 with grade scale A in the Excellent category, so this research has succeeded in improving user experience, and the design thinking method is effective in application redesign research.

Keywords: Design Thinking; Redesign; System Usability Scale (SUS); User Interface; User Experience

Introduction

The school adopts information technology as a supporting tool in information processing. The administration process is still manual, making data management more difficult(Fakhriza & Savitri, 2023; Syafitri et al., 2020), so that to facilitate administrative and smooth activities of teachers and students, now almost all schools ranging from junior high school to university level have adopted a website-based system (Hidayanti et al., 2023). One of the existing web-based systems is the Ezzi School application that has been used by approximately 10 schools, including SMAN 7 Bogor, SMK Amaliah 1 Ciawi, SMK Setia Negara, and SMK Taman Harapan.

Ezzi School is an application created by PT. Elang System Solusi Indonesia, as a web-based school information system application that focuses on technology and management, with innovative products and services. The Ezzi School application functions as a platform to manage administrative information systems in schools whose uses include student and teacher data management, as well as school management such as schedules and subjects. The partnership aims to empower schools with technology to improve teaching methods and engage students. This website-based Ezzi School application is used by the admin as the operator of the school information system.

Pre-research results show some problems with the appearance and low level of user experience. The following table shows the results of testing the Ezzi School application with the System Usability Scale (SUS) method before redesign.

Initial testing in pre-research carried out calculations using the System Usability Scale method of 10 statements with a Likert scale, a range of 1 (strongly disagree) to 5 (strongly agree) which is calculated using the System Usability Scale calculation formula according to John Brooke in 1986 (Andysa, 2022) shows the final result of an average score of 33 which means not acceptable with grade scale F, and adjective rate

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"Awful". These results indicate a low level of user satisfaction, so it is necessary to make improvements to the appearance of the Ezzi School application.

Table 1. SUS Score

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Score
R1	4	4	3	4	2	5	2	4	2	5	28
R2	4	4	3	4	2	4	2	4	3	4	35
R3	4	3	3	2	2	4	2	4	2	4	40
R4	4	3	3	4	2	4	2	3	2	4	38
R5	4	4	3	3	2	4	2	4	2	5	33
R6	3	4	4	5	2	4	1	4	2	5	25
R7	4	3	3	4	2	4	3	4	2	4	38
R8	4	4	3	5	2	5	2	3	2	4	30
R9	4	3	3	3	2	4	2	4	1	4	35
R10	3	4	3	4	2	4	1	3	2	4	30
Average Score											33

The appearance, components, and some elements need to be improved based on the low level of user experience, so a redesign is needed in order to improve user experience and be more comfortable in using the Ezzi School application, so that the website will be more optimized. user interface is a major factor in user experience, so the website needs to have flexibility and strong appeal. User Interface (UI) aims to make information technology easy and comfortable to use by users (user friendly) so it is very important to increase user comfort (Hasna et al., 2023). User Experience (UX) is also very important for application design because it organizes the user experience, assesses ease, and comfort of use.

Based on the background of the problem, this research aims to evaluate and redesign the Ezzi School application using the Design Thinking method, and measure the level of user experience using the System Usability Scale (SUS) method. This research will have an impact in improving user experience to make it easier to manage school administration data, as well as a reference or reference in other research on application redesign and the use of design thinking methods.

Method

The research will be related to prototype design that focuses on the convenience of user experience, so researchers use the Design Thinking method. The expected end result is a redesign prototype that will go through a series of iterations until it reaches a design prototype that meets user needs. Applying the Design Thinking approach and testing using the System Usability Scale (SUS) method can support user experience analysis and prototype creation. Design Thinking is a user-based iterative method to solve problems in user interface and user experience. Therefore, user participation is crucial because the final result of the prototype design will be directly used by users (Susanti et al., 2019).

The research process consists of several main stages, namely literature study by reviewing various relevant previous studies; identification of problems based on the results of initial observations; data collection is carried out by two main methods, namely interviews and distributing questionnaires; analysis of the needs of designing solutions with the design thinking method consisting of empathize, define, ideate, prototype, and testing; designing prototypes developed in the form of frontends; testing with the System Usability Scale (SUS); and evaluating the overall results so that they are feasible and submitted to PT Elang System Solusi Indonesia to be implemented and further developed.

Design Thinking is an approach that facilitates understanding of user needs with the aim of creating solutions that solve problems faced by users. There are five steps in the Design Thinking method, namely Empathize, Define, Ideate, Prototype, and Testing (Pratama & Indriyanti, 2023).

a. Empathize is the first step as a process to understand the user's point of view, identify the problems faced, and find out the needs that must be met in the design process. At this stage, data collection is carried out by conducting interviews and distributing questionnaires and then compiled in an empathy map which is divided into four quadrants (Says, Thinks, Does, Feels) with the user in the middle (Naim et al., 2021; Pratama & Indriyanti, 2023).
b. Define is done after understanding empathize. starts from grouping, filtering, and analyzing the data that has been collected using Affinity Diagram. The goal is to identify the problems faced by users so that the core problems can be found and the solutions generated are exactly in accordance with user needs (Pratama & Indriyanti, 2023).
c. Ideate involves developing solution ideas based on the core problem. brainstorming sessions are carried out to get as many ideas as possible [34] the use of the How Might We method at this stage in order to focus on the specific problems faced by users because it is possible to find solutions that suit user needs. The solution ideas generated will then be applied in the design of the user interface design and prototyping (Herfandi et al., 2022; Sodik et al., 2024).
d. Prototype is the phase where the developed ideas are then applied to the application design to showcase the application design process according to user needs and provide an overview of how users

interact with the application being developed. This stage involves creating wireframes from low-fidelity to high-fidelity (Novita et al., 2024).

e. The testing phase aims to conduct testing on the website redesign prototype that has been created according to the solution ideas and user needs. The testing was conducted using the System Usability Scale (SUS) method to obtain the user experience score. Given through a 10-statement SUS Questionnaire provided to 10 respondents, namely the admin of Ezzi School (Novita et al., 2024).

System Usability Scale (SUS) is a method for measuring the extent to which the created system is suitable for use or not. The score generated from the SUS method can be an important factor in evaluating an application. According to John Brooke 19986 (Andysa, 2022) this method uses a questionnaire containing 10 positive and negative statements, where odd-numbered statements contain positive sentences, while even-numbered statements contain negative sentences. Consists of 5 answers with a Likert scale, including options from strongly agree, agree, neutral, disagree, to strongly disagree (Wardani et al., 2023). Shown in the following Table 2 (Wahyuningrum, 2021).

Table 2. Questionnaire SUS

Number	Questions
1	I think that I would like to use this system frequently.
2	I found the system unnecessarily complex.
3	I thought the system was easy to use.
4	I think that I would need the support of a technical person to be able to use this system.
5	I found the various functions in this system were well integrated
6	I thought there was too much inconsistency in this system.
7	I would imagine that most people would learn to use this system very quickly.
8	I found the system very cumbersome to use.
9	I felt very confident using the system.
10	I needed to learn a lot of things before I could get going with this system.

Next, data calculation is carried out using the SUS formula which has rules in its assessment which are contained in the Formula 1.

$$R = ((Q1 - 1) + (5 - Q2) \ldots + (5 - Q10)) \times 2.5 \quad (1)$$

Information:
R = respondents
P = question

Then, the SUS score of each respondent is calculated to produce an average score, by adding up all the scores and dividing by the number of respondents with Formula 2.

$$\bar{x} = \frac{\sum x}{n} \quad (2)$$

Information:
$\bar{x}$ = average score
$\sum x$ = total score SUS
n = number of respondents

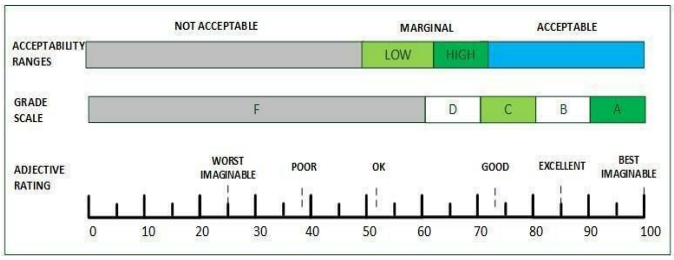

Figure 1. Category of SUS

Figure 1 shows the parameters for calculating the SUS score categorized based on Acceptability Ranges to determine whether the application is acceptable or not, consisting of Not Acceptable, Marginal, and Acceptable. Next, the Grade Scale consists of five letters: F, D, C, B, A. Finally, the Adjective Range to clarify the level of usability consists of Worst Imaginable, Poor, OK, Good, Excellent, and Best Imaginable .The score range is shown in Table 3 (Alam & Kurniasih, 2024; Karaman & Cobantoro, 2021; Wardani et al., 2023).

Table 3. SUS Score

Score SUS	Grade Scale	Adjective Range
>80.3	A	Excellent
68-80.3	B	Good
68	C	Okay
51-68	D	Poor
<51	F	Awful

Result and Discussion

Based on the research that has been conducted, which addresses the issues present in the Ezzi School application, through the design thinking stage, this research resulted in a prototype redesign of the Ezzi School application, as well as testing the redesign results using the System Usability Scale (SUS) method.

Empathize

At this stage, interviews and questionnaire filling are conducted for several respondents who use the Ezzi School application to understand user experiences and comprehend the issues faced. In the interview process,

it is categorized into four quadrants: says, thinks, does, feels. The list of interview questions in Table 4.

Table 4. Interview Question

Parameter	Questions
Says	Are you experiencing any issues while using the application? If yes, please explain.
Thinks	When using the application, are there any features that are less effective and difficult to use? Is there anything important that hasn't been addressed? If so, explain and provide suggestions.
Does	In your opinion, how capable is the Ezzi School application? How do you overcome the difficulties encountered when using the application?
Feels	How do you feel when using that application?

The results of the interviews and questionnaire responses are presented in the empathy map in Figure 2.

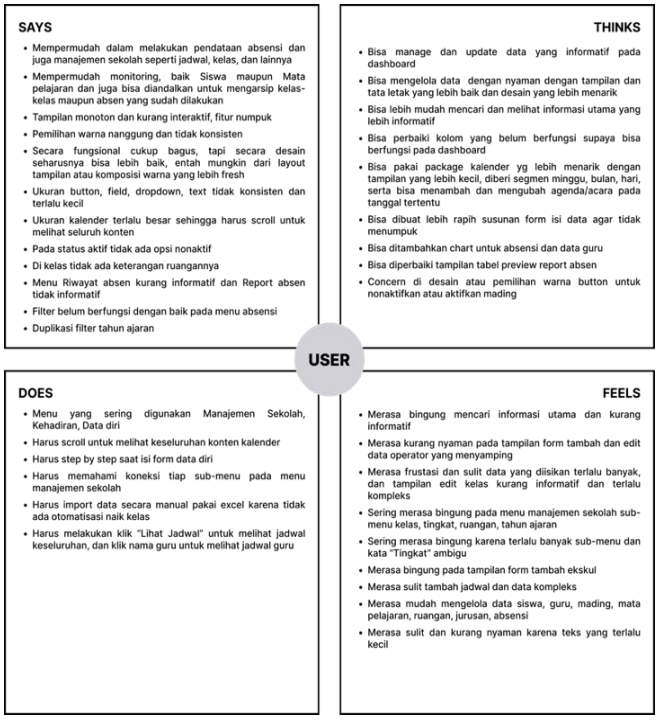

Figure 2. Empathy map

The empathy map shows the user experience from various interconnected factors, such as interface design, usability, accessibility, and emotional factors. From this empathy map, it will be further defined in the define stage by optimizing all factors.

Define

The define stage involves defining user needs according to the problems at hand, illustrated with an Affinity Diagram in Figure 3.

The affinity diagram is divided into three categories: constraints, goals, and needs, which are written in bullet points for each menu and the overall user requirements. Constraints that encompass various issues with the interface and system, goals that focus on the desire to improve ease of access and data processing, and needs that must be met for the interface and system to be more effective. With these three aspects, the ideation process will be more focused on what users want and need.

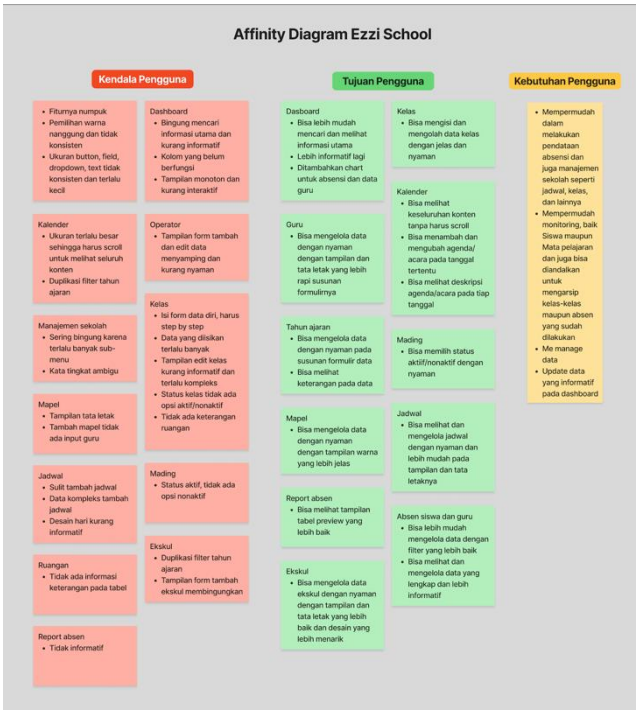

Figure 3. Affinity Diagram

Ideate

Development of solution ideas from problem analysis results through brainstorming and the How Might We technique to generate many ideas, so that the resulting solutions will be optimal and meet user needs. Here is the How Might We shown in Table 5.

Table 5. How Might We

How	***Might***
HMW create a more informative dashboard display?	Displaying a summary of important/main data in a more structured view.
HMW simplify the input form to make it more efficient?	Reduce the number of less important input fields and arrange them vertically.

How	*Might*
HMW create a more consistent and appealing User Interface?	Creating a design system that includes standard rules for colors, icons, buttons, and layouts.
How might we create a calendar that is more informative and user-friendly?	Providing a calendar view with monthly, weekly, and daily options, as well as allowing users to add agendas.
How might we create menu names that are easy to understand?	Using more common and familiar terms.
How might we make UI elements more uniform and the appearance neater?	Applying uniform UI design guidelines for button sizes, input fields, and spacing between elements.
HMW redesign the class management menu to make it easier to use?	Combining several interrelated sub-menus into one menu to facilitate management.

The results of the ideate stage that will be applied in the creation of the user interface prototype design in Table 6.

Table 6. Result of Ideate

Number	Ideate
1	The color change becomes brighter.
2	Replacement of font type and size
3	Improvement of the information displayed on the dashboard page.
4	Improvement of the "Calendar" page design to be simpler and categorized by month, week, and day, as well as the addition of a feature to add agendas.
5	Correction of the sub-menu name from "Tingkat" to "Jenjang".
6	The merging of several sub-menus into one sub-menu because they are interconnected and categorized using Tabs.
7	Reduction of form fields in the add data feature.
8	Design and layout improvements

Prototype

This stage is the development of ideas from the ideate stage, then implemented in the UI design of the Ezzi School application to create a redesign that meets user needs and illustrates the interaction between users and the application. The design was created as low-fidelity to high-fidelity wireframes.

a. Wireframe low-fidelity
   Lo-fi wireframe becomes a basic representation of a design that is still in black and white. Here is the wireframe display.

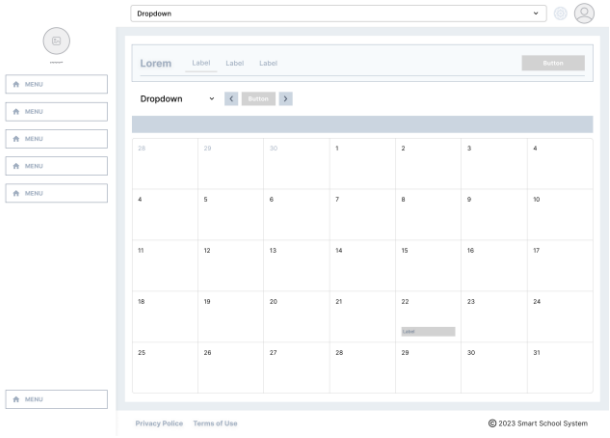

Figure 4. Wireframe Lo-Fi Calendar

Figure 4. is wireframe Lo-Fi calendar page is categorized into monthly, weekly, and daily, and displays the agenda in the date column.

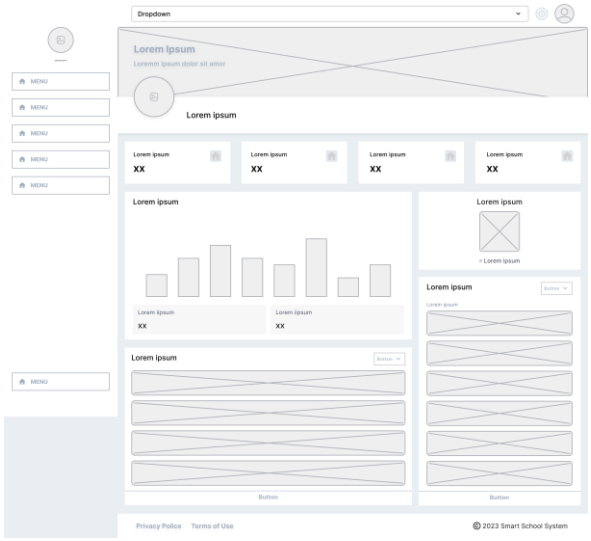

Figure 5. Wireframe Lo-fi Dashboard

Figure 5. is Lo-Fi wireframe display of the dashboard page shown in the home menu, containing important information such as student data diagrams, the number of students and teachers, agendas, and announcements.

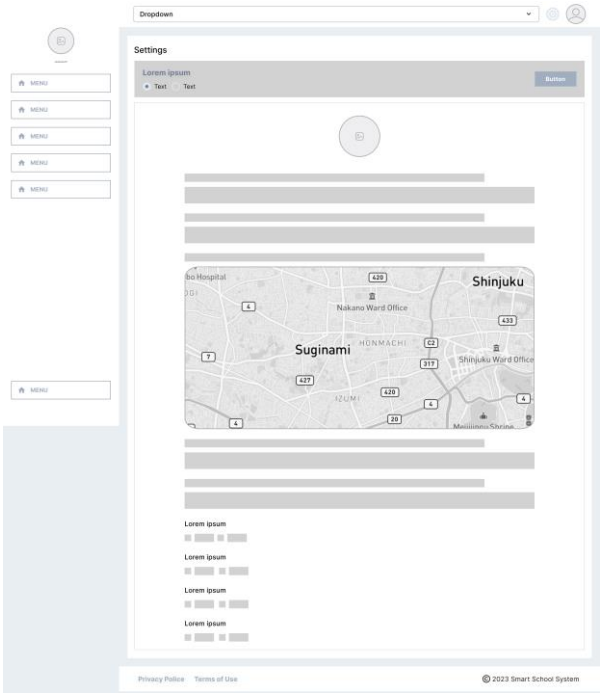

Figure 6. Wireframe Lo-fi Settings

Figure 6. is the settings page that contains information about the settings.

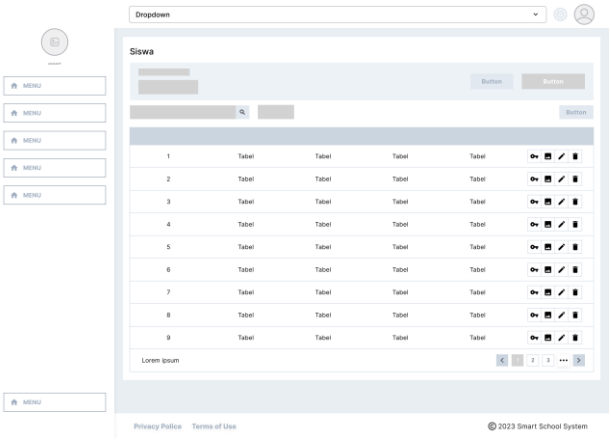

Figure 7. Wireframe Lo-fi Personal Data

Figure 7. shows the Personal Data menu on the Student page, which contains a student data table. There are sub-menus for PPDB, Student, Teacher, and Operator.

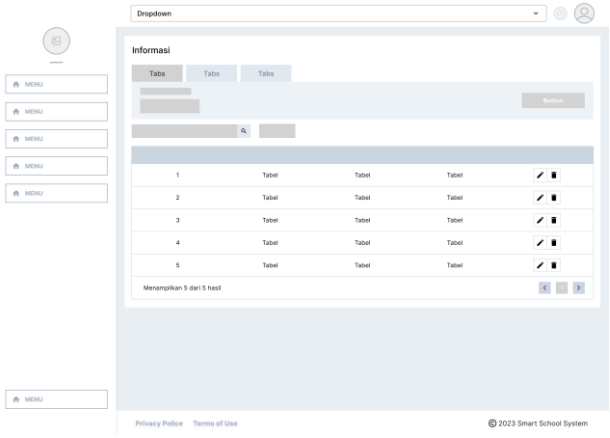

Figure 8. Wireframe Lo-fi Information

Figure 8. is a new sub-menu in the school management menu, containing three sub-sections categorized by tabs. Each displays information created for students or teachers. In several other sub-menus in the school management menu, there are also similar appearance changes.

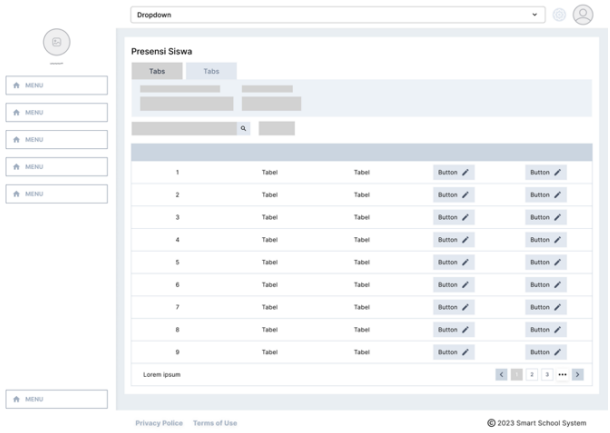

Figure 9. Wireframe Lo-fi Attendance

Figure 9. is one of the Attendance sub-menus, consisting of a student attendance data table that includes an edit attendance button, as well as an attendance report.

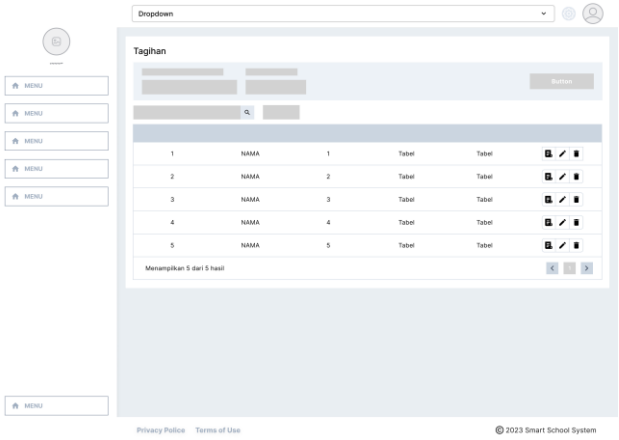

Figure 10. Wireframe Lo-fi Payment

Figure 10. is the Payment menu, displaying the student's school payment bill information.

b. Wireframe high-fidelity

High-Fidelity is the final design draft before it is developed into a prototype. In this wireframe, the content is filled in and applies the design system, such as the use of diagrams, images, icons, colors, typography, and others. Here is the high-fidelity view.

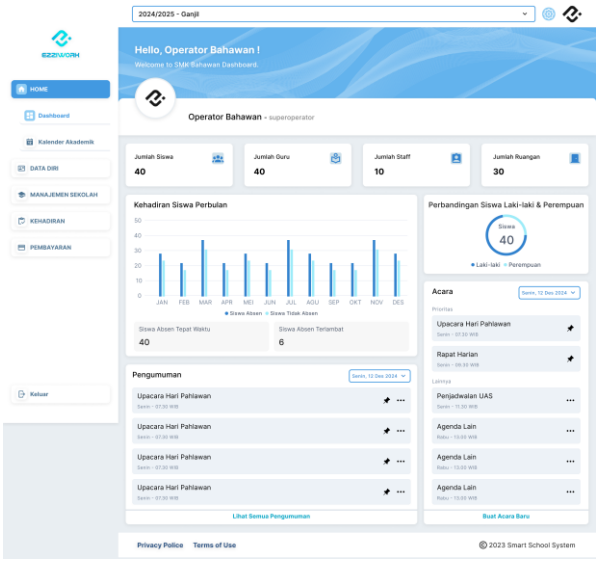

Figure 11. Hi-fi Dashboard

Figure 11. shows the dashboard display, which already presents the main information, such as the student attendance chart and the comparison of the number of students, information on the number of students, teachers, staff, and rooms, as well as brief information on announcements and events.

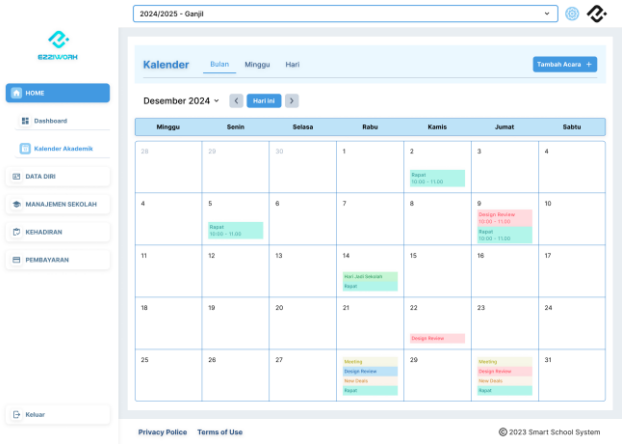

Figure 12. Hi-fi Calendar

Figure 12. of the Calendar page displays agenda information in the date column, and there are tabs to categorize by month, week, and day.

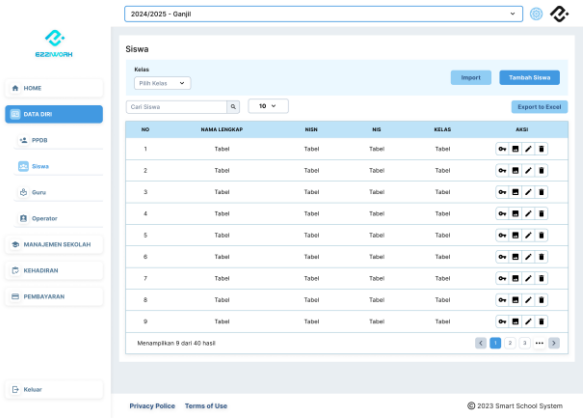

Figure 13. Hi-fi Personal Data

Figure 13. shows the Personal Data menu on the Student sub-menu page, displaying student data information, with action buttons for importing and exporting data, and the Add Student feature.

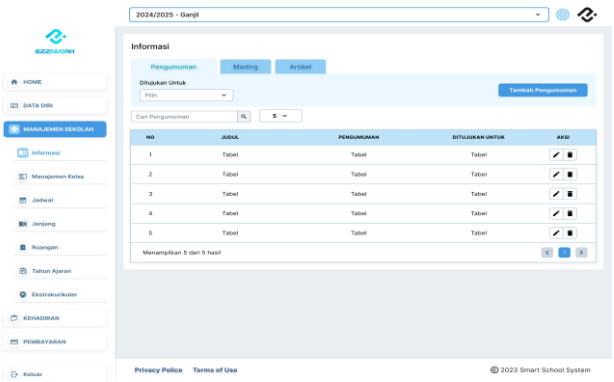

Figure 14. Hi-fi School Management

Figure 14. School Management menu sub-menu Information. Displaying school information such as announcements, bulletin board, and articles.

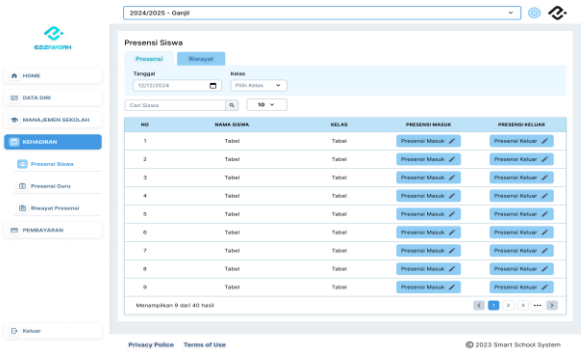

Figure 15. Hi-fi Attendance

Figure 15. Attendance menu, consisting of Student Attendance, Teacher Attendance, and Attendance History.

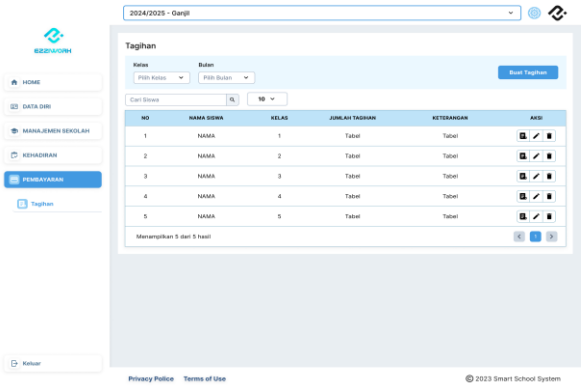

Figure 16. Hi-fi Payments

Figure 16. of the Payment menu displays information on student school payment bills.

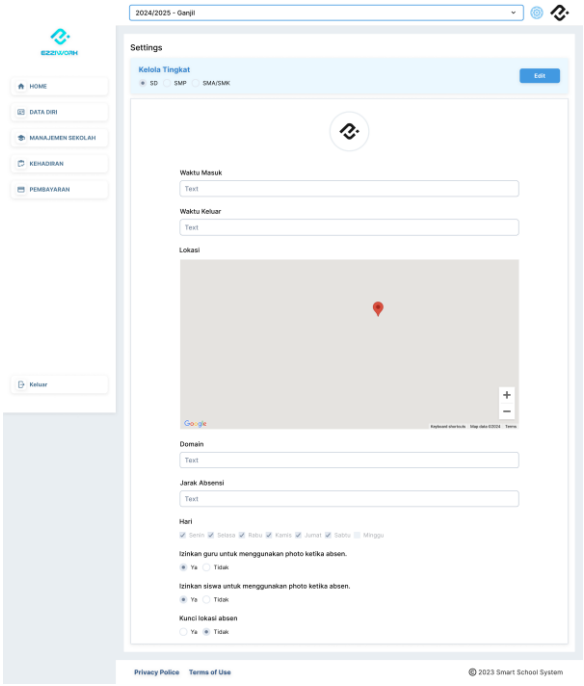

Figure 17. Hi-fi Settings

Figure 17. the Settings menu, displays the settings for the application menu, such as attendance and level options.

Prototyping

Prototyping is the final stage of this redesign process, where the high-fidelity design is then created as a frontend so that the application interface runs, and it proceeds to the next stage, which is testing. Here are the results of the Ezzi School app redesign.

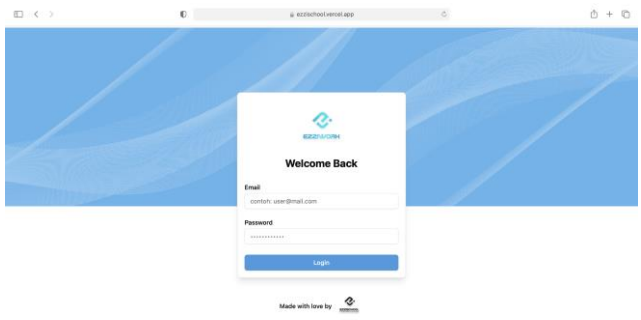

Figure 18. Login page

Figure 18. Login is the initial step taken to access the application, so an attractive interface can be an appeal for users when starting the Ezzi School application. having changes in background addition, as well as a neater arrangement of the login form and the use of a more colorful logo.

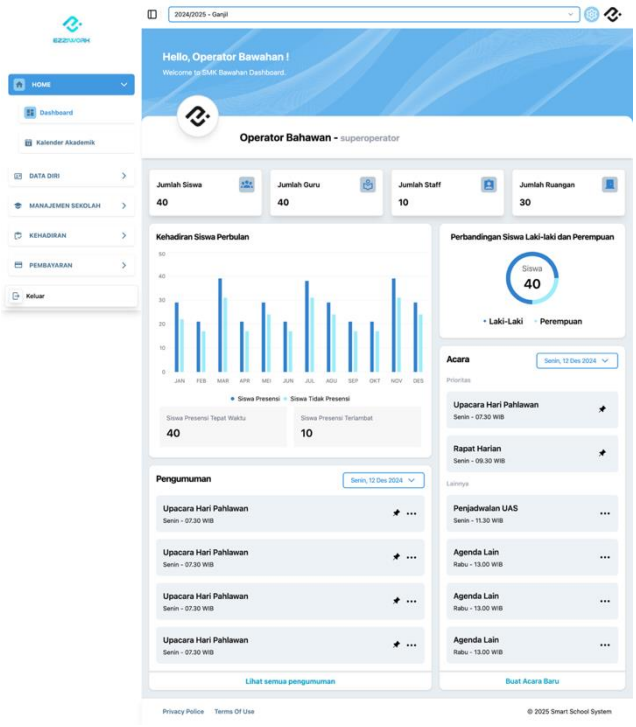

Figure 19. Dashboard page

Figure 19. The dashboard page has many changes, especially in features and layout. In the new design, more key information is displayed, such as the number of students, teachers, staff, and rooms, as well as student attendance charts, a comparison of the number of male and female students, and the addition of announcement and event information features.

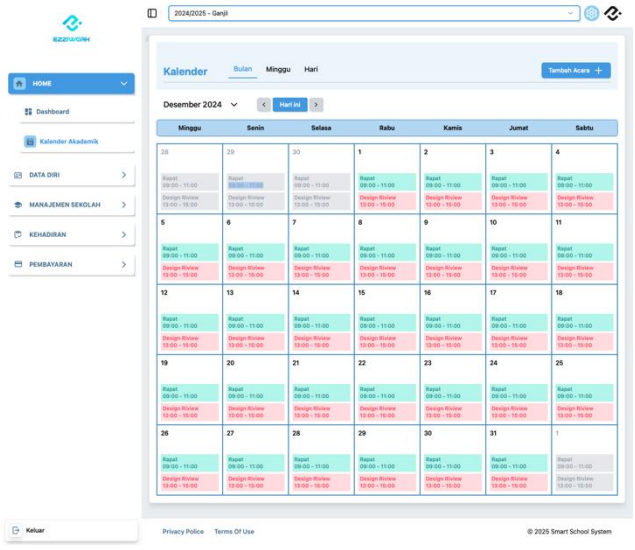

Figure 20. Calendar page

Figure 20. The calendar page has undergone changes, such as the addition of month, week, and day categories distinguished by tabs. The addition of the Add Event feature displayed in the date column contains information about the event's title and time.

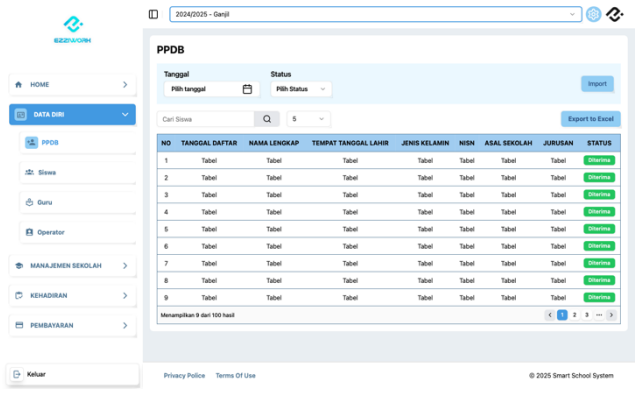

Figure 21. PPDB page

Figure 21. The PPDB page contains information in the form of new student candidate data displayed in a table. In the previous design, this feature was not functioning, so no information was displayed.

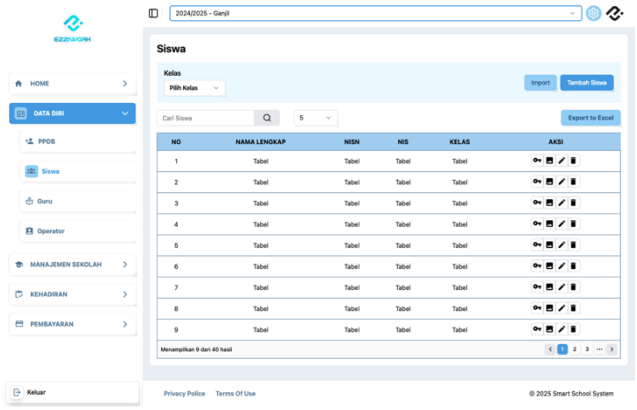

Figure 22. Student page

Figure 22. The Student Page displays students personal information. Not many changes on this page, just layout adjustments.

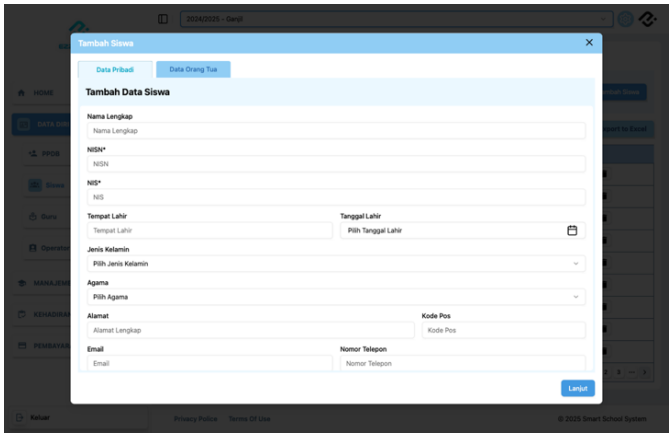

Figure 23. Feature Add student

Figure 23. The Add Student feature is a pop-up that displays a form for entering student data. The layout of the form is made more systematic and categorized using tabs, so it can adjust to the data that needs to be changed.

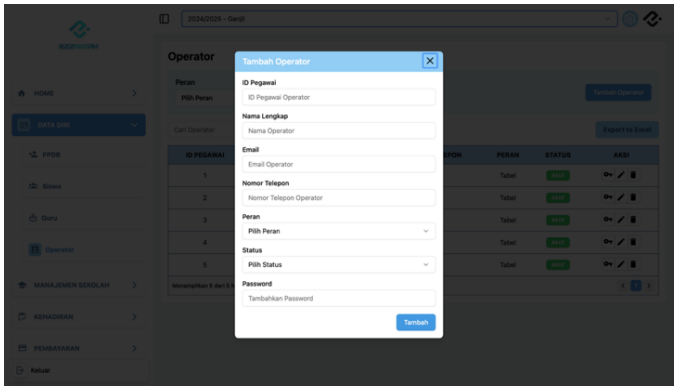

Figure 24. Feature Add operator

Figure 24. The Add Operator feature has a different appearance from the previous design. The new design features a streamlined form layout and a reduction in less relevant form fields, along with the addition of an Active or Inactive Status option.

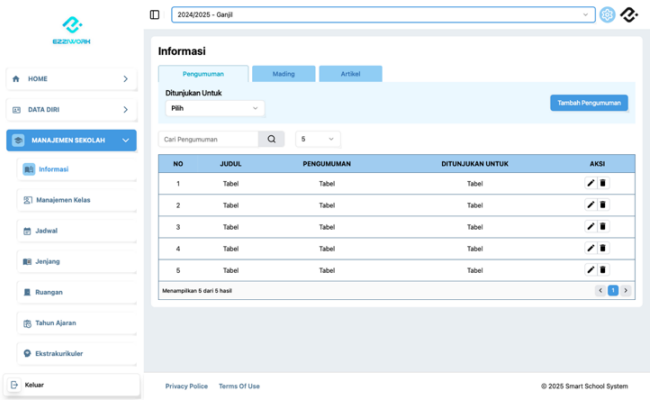

Figure 25. Information page

Figure 25. The Information Page is a new sub-menu created to combine the Announcement, Bulletin Board, and Article sub-menus. The three sub-menus were combined because they have the same correlation, which is information, so the new sub-menu was named "Information."

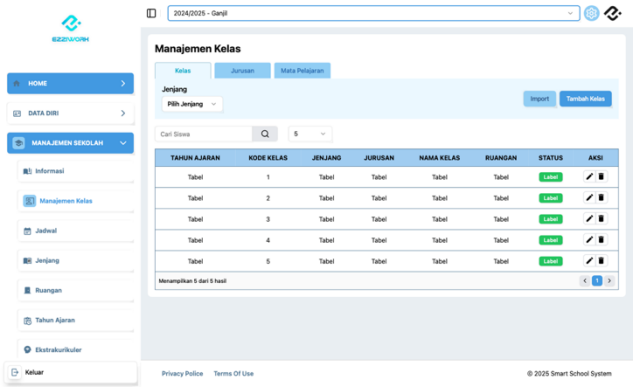

Figure 26. Class Management page

Figure 26. The Class Management page becomes a new sub-menu from the combination of the Class, Major, and Subject sub-menus, as it has similar correlation and functionality for managing student learning.

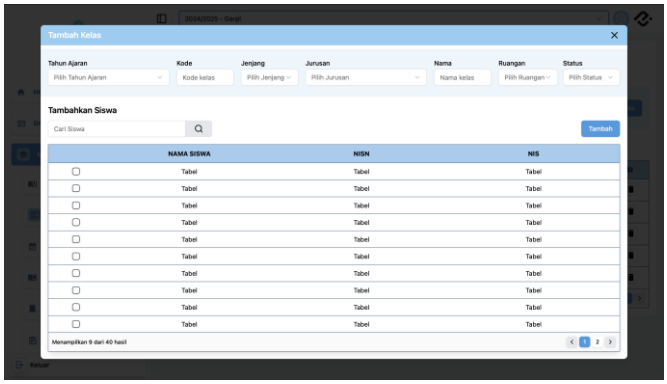

Figure 27. Feature Add class

Figure 27. There are additional filters, layout revisions, and the Add Class form view has been enhanced with Room and Status options to complete the information. On the Department page, an information column for Level has been added.

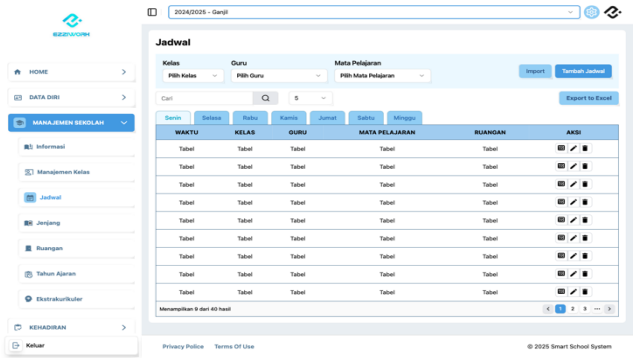

Figure 28. Schedule page

Figure 28. The Schedule page has undergone quite significant changes in appearance and layout. The schedule is displayed directly on the front page. Additionally, there is a change in the Time data table column, which was merge named Class and Hour.

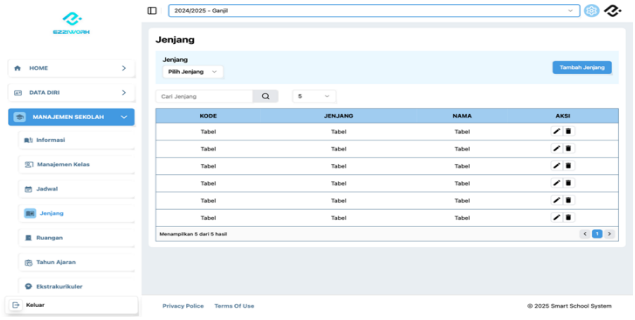

Figure 29. Jenjang Page

Figure 29. The "Jenjang" Page is a change from word "Tingkat". The different was made to align with a more familiar and commonly used term.

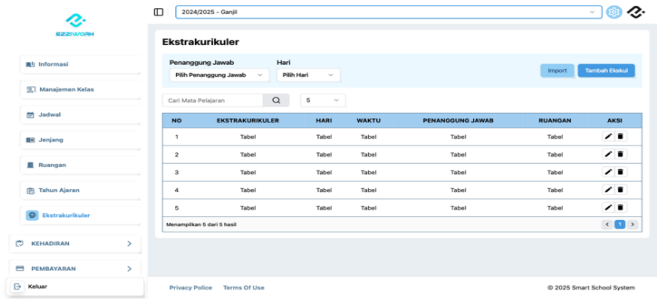

Figure 30. Extracurricular page

Figure 30. The Extracurricular page has changes to the sub-menu names and column names in the data table, which previously used the abbreviation "Eskul". So that the displayed information can be clearer and does not use abbreviations. There is a change in the name of the Time column, which was previously called Hour, and the addition of the Room column.

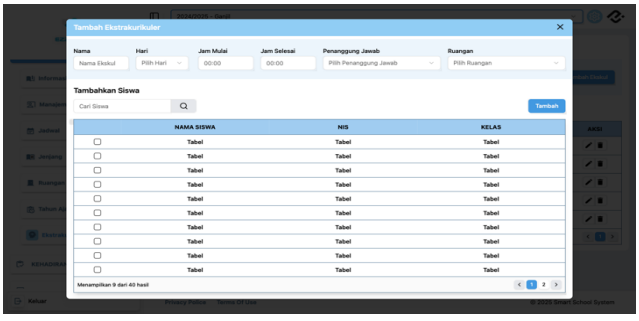

Figure 31. Feature Add Extracurricular

Figure 31. The Add Extracurricular Feature has a quite significant change in appearance. The design was made more systematic for data entry. The student addition column in the table, its categories have been changed to Student Name, NIS, Class. Additionally, the filter for searching student data has been removed and replaced with a search bar.

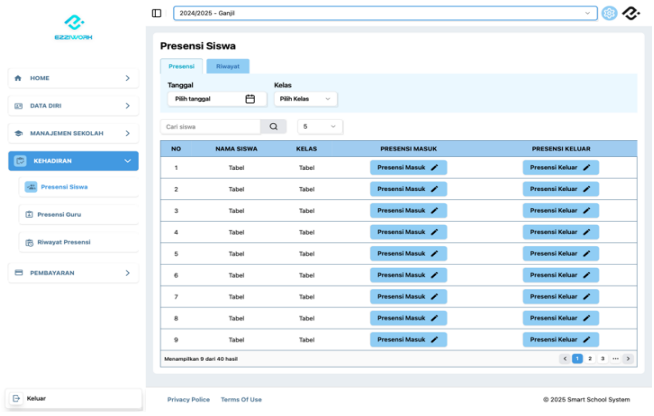

Figure 32. Attendance page

Figure 32. The attendance menu has been merged with several relevant sub-menus, and the word "Absen" has been replaced with "Presensi". The Student Attendance page is a combination of the Student Attendance menu and the Student Attendance History.

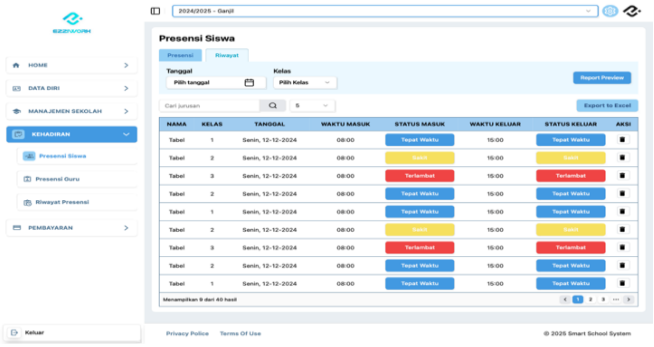

Figure 33. Student Attendance history

Figure 33. In the History data table, the Status data is combined, where attendance details can be viewed in the status, which serves as an action button.

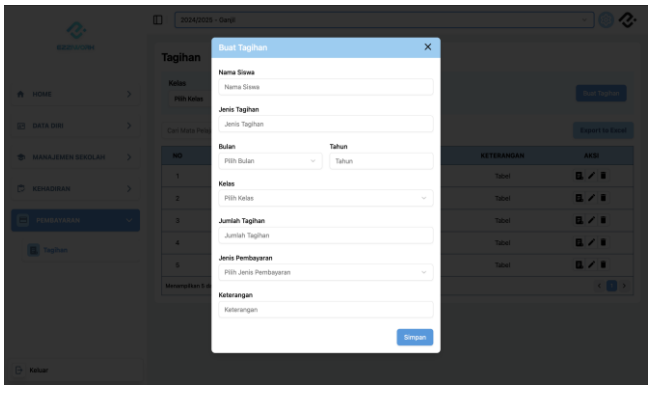

Figure 34. Feature Create Invoice

Figure 34. The Create Invoice feature has a change in the layout of the form, which is now vertical, as well as the addition of the targeted Student Name field. The Billing Type data is a change from the Billing Name. In addition, the quantity and content of the form have also been revised according to user needs.

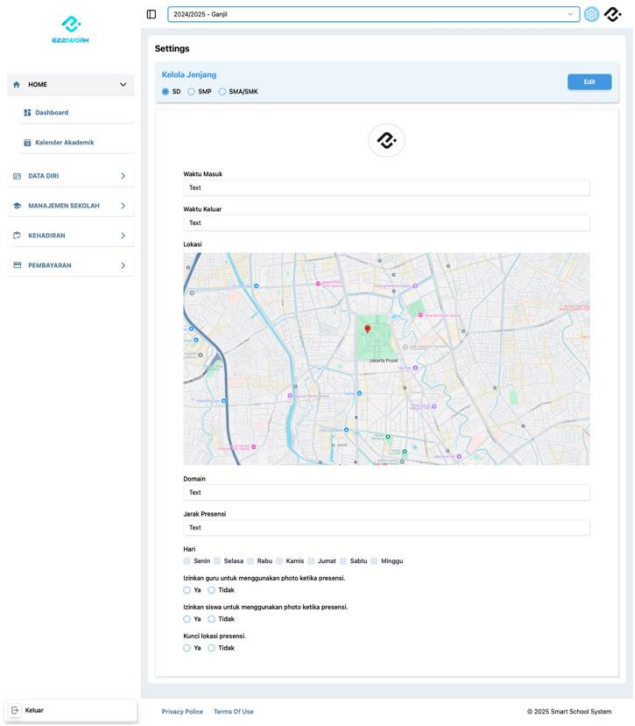

Figure 35. Settings page

Figure 35. The Settings page has been updated with the addition of "Jenjang" settings to manage data universally based on Level.

Testing

Testing is the final stage of this research, aimed at evaluating the prototype of the redesigned Ezzi School application that has gone through several stages of design thinking. The results of the testing were evaluated using the System Usability Scale (SUS) matrix to determine whether they meet the needs and are suitable for further development. The testing was conducted online via Google Meet and the completion of a questionnaire link from Google Forms containing the System Usability Scale (SUS) statements.

The testing is aimed at 10 respondents who are users of the application, specifically as school administrators. The testing was conducted periodically with several respondents via Google Meet, and some were given a prototype link to try the application independently. Starting with a general explanation of the changes made, followed by a demo of the redesigned application, the respondents were then given the application prototype to explore further and

provided with a testing questionnaire containing SUS statements to fill out as feedback.

The results were calculated and the average scores were categorized based on acceptability, grade scale, and adjective rating. Overall, the results of the test calculations in Table 6.

Table 7. Score SUS

Respondent	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q 10	Score
R1	5	2	5	2	4	2	4	1	4	3	80
R2	5	1	4	2	5	1	4	2	4	2	85
R3	5	2	5	1	5	2	5	1	5	4	88
R4	5	1	5	2	4	1	4	1	5	2	90
R5	4	1	4	1	4	1	4	2	5	2	85
R6	5	1	5	1	5	1	5	1	5	2	98
R7	4	2	5	2	5	1	5	1	5	2	90
R8	5	2	4	2	5	2	4	1	4	2	83
R9	4	1	5	2	5	2	4	1	4	2	85
R10	5	1	5	2	5	2	4	1	4	2	88
Average Score											87

The results of the post-research testing using the System Usability Scale method were obtained from 10 SUS statements with a range of 1 (strongly disagree) to 5 (strongly agree) and calculations using the SUS formula according to John Brooke, where odd-numbered statement responses are scored as 1, and even-numbered statement responses as 5, as indicated in formula (1), and then each respondent's score is multiplied by 2.5.Then the average was calculated using formula (2) by summing all the respondents' scores and dividing by 10, the number of respondents. Thus, an average score of 87 was obtained, which means acceptable, with a grade scale of A, and an adjective rate of "Excellent."

There was an increase in the average score by 54 points, to 87 with an A grade scale, compared to the average score in the pre-research phase of 33 with an F grade scale. Based on this, there has been an improvement in user experience and satisfaction with the redesigned appearance of the Ezzi School application. Thus, it proves that this research has had a positive impact on users in terms of comfort and meeting their needs when using the application.

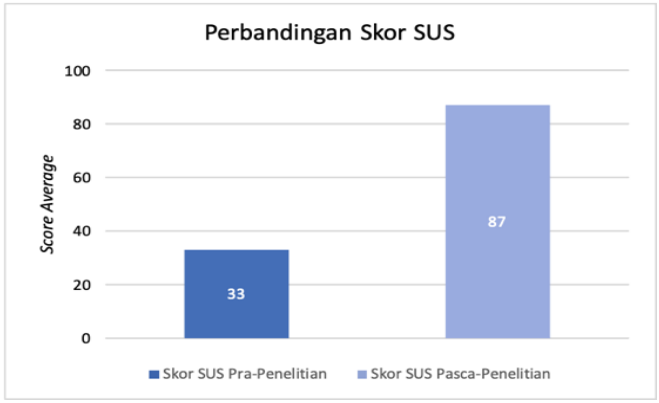

Figure 36. Comparison of score

Figure 36. shows a comparison of pre-research and post-research SUS scores that have a significant difference. The initial score was lower based on user experience before the research, and the final score was higher based on the implementation of the redesign. This proves that the results of the Ezzi School app redesign were accepted and had an impact on improving the user experience.

Conclusion

Redesign the user interface of the Ezzi School application for comfort and to enhance the user experience in managing school administration using the design thinking method, which consists of the stages of empathize, define, ideate, prototype, testing. The testing results were calculated using the System Usability Scale (SUS) method, and obtained an average score of 87, which is acceptable with a grade scale of A and categorized as Excellent. Therefore, the results of the Ezzi School application redesign are deemed worthy and can proceed to the next development stage.

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This research is the implementation of a final project, so I would like to thank all parties who have supported and assisted in the completion of this research. I hope this research can serve as a learning resource and a reference for future studies.

Author Contributions

Writing – original draft, conceptualization, methodology, analysis, E.C.S.; Supervision, validation, resources, project administration, A.D.S.; Investigation, visualization, E.C.S. and A.D.S.

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Conflicts of Interest
The authors declare no conflict of interest.

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