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Decision Support System For Submitting and Evaluating Web-Based Scholarships Using The Topsis Method at SMP Kusuma Raya

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ABSTRACT

This research aims to develop a web-based decision support system for the scholarship application and assessment process. The system is designed to improve efficiency, transparency, and objectivity of selection. The TOPSIS method is used to evaluate potential recipients based on a number of relevant criteria. The system was developed using PHP, MySQL, Visual Studio Code, and XAMPP as the development platform. System testing shows that this application is able to provide accurate scholarship recipient recommendations, so that it can help decision makers in determining recipients more fairly and systematically. With this approach, it is expected that the scholarship selection process will become more structured and reduce the potential for subjectivity in assessment. The results of this research contribute to the application of information technology in supporting a better selection system in the academic environment and scholarship granting institutions.

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1. Introduction

Education is a strategic factor in improving the quality of human resources, especially in the digital era that demands competitive skills and knowledge [1][2]. However, not all students have equal opportunities to access quality education, especially those who come from economically disadvantaged families [3] [4]. To overcome this gap, scholarship programs are an important instrument provided by educational institutions to help outstanding and underprivileged students [5][6]

At Kusuma Raya Junior High School, the scholarship selection and application process is still done manually, making it vulnerable to administrative errors, subjective assessments, and delays in the selection process [7][8]. Therefore, a computerized system is needed that is able to assist in making decisions objectively, quickly, and transparently. One effective approach is to use a web-based Decision Support System (SDM), which allows users to conduct the application and selection process online [9][10]. SPK provides support in the decision-making process by analyzing a number of alternatives based on certain criteria [11].

In this research, the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method is used, which has been proven effective in handling multicriteria decision-making problems[12][13] . The TOPSIS method works by measuring the relative closeness of each alternative to positive and negative ideal solutions, thus helping to select the best alternative [14][15].

Various studies have shown that the TOPSIS method is suitable for application in scholarship selection systems because it is able to handle various types of data, different criteria weights, and produce consistent and measurable decisions [16][17][18]. The combination of SPK, TOPSIS method, and web-based implementation allows the scholarship selection process to be more efficient, transparent, and accountable [19][20].

With a web-based system, students or parents can access scholarship information and services without having to come directly to the school, and can monitor the selection process in real-time[21][22] . This system also allows for more integrated data management and minimizes manual input errors [23].

This research aims to design and implement a Website-based Scholarship Application and Assessment Decision Support System with the TOPSIS Method at Kusuma Raya Junior High School, with the hope of increasing efficiency and fairness in the selection process of scholarship recipients [24][25].

This research involves the use of internal school data and activities, making it essential for the researcher to obtain official permission from SMP Kusuma Raya. Such permission should be secured through the school principal or other authorized personnel. Additionally, the use of student data—such as report card grades and personal identification—must strictly follow confidentiality and privacy standards, ensuring that no sensitive or personally identifiable information is disclosed.

If the research requires direct interaction with students, teachers, or school staff, the researcher must obtain informed consent, particularly when involving underage participants. This consent should be in written form and clearly state the purpose, procedures, and potential impacts of the study. Moreover, the researcher is obligated to present an official introduction letter or research permit issued by their affiliated institution. This serves as a formal authorization and reinforces the researcher's accountability.

All research activities must be carried out in a professional and ethical manner, with careful attention to avoid any harm, disruption, or negative consequences for individuals or the institution involved. By adhering to ethical guidelines and relevant regulations, the research process will maintain its integrity and credibility, ensuring the protection of all participants and the legitimacy of the research outcomes.

2. Research Method

2.1. Stages of Problem Formulation

The stage of identifying and even facilitating the study of problems is known as the problem formulation stage. This must be done to support the research in developing a system that prevents the research from going out of the defined boundaries.

2.1.2. Data Collection Stages

1. Interveiw
   Conducted face-to-face, interviewees who were considered have insight into the research that I am observing, such as the admin at Kusuma Raya Junior High School.
2. Observation
   Participated in Kusuma Raya Junior High School to obtain information about the criteria used in supporting scholarship applications and scholarship assessment that will be processed in a website.
3. Literature Study
   This process was carried out by studying all the data collected from the research location, namely Kusuma Raya Junior High School, as well as analyzing related theories through articles, books, and other sources. Analyzing related theories in this case through articles, books, and the library of the Department of Informatics books, and the library of the Informatics Management Department of Politeknik Sriwijaya State.
4. Documentation
   Conducted by collecting information from Kusuma Junior High School Raya Junior High School and existing recording documents. In using the documentation data collection technique, it is important to ensure the accuracy and constraints of the information obtained as well as the pay attention to the context of the documents used.

2.2. TOPSIS

The TOPSIS method is an approach that calculates alternatives in comparing the distance between positive and negative ideal solutions. The method This method applies a geometric approach as well as a distance that assesses the closeness of the options to the best solution. TOPSIS ranks each alternative based on its closeness to the positive ideal solution. The resulting ranking can then be used for reference in decision to choose the most optimal alternative.

2.2.1. TOPSIS Analysis Function Method

The system was created using the fuzzy topsis algorithm. Steps in processing as follows.

1. Compile a normalized decision matrix.

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}} \quad (1)$$

2. Forming a normalized decision matrix is important.

$$y_{ij} = w_i r_{ij} \quad (2)$$

3. Construct positive ideal solution matrix and negative ideal solution matrix.

$$A^+ = y_1^+, y_2^+, \dots, y_n^+ \quad (3)$$
$$A^- = y_1^-, y_2^-, \dots, y_n^-$$

4. Identifying the distance between the value of each alternative and the positive and negative ideal solution matrix positive and negative ideal solution matrix.

$$D_i^x = \sqrt{\sum_{j=1}^{n} \left(y_1^+ - y_{ij}\right)^2}$$
$$D_i^- = \sqrt{\sum_{j=1}^{n} \left(y_{ij} - y_1^+\right)^2} \quad (4)$$

5. Compile preference values for each alternative

$$V_i = \frac{D_i^-}{D_i^- + D_i^+} \quad (5)$$

3. Result and Discussion

Analyze the problem set according to the objectives to be obtained, including understanding the structure of the system. In order to obtain accurate data as well as relevant, Apply various ways of collecting data in this research, so that the decisions taken can support the development of a Website-Based Website-Based Scholarship Submission and Assessment Decision Support System. The feasibility is built as follows.

1. Technical Feasibility: Kusuma Raya Junior High School has the hardware and hardware and software to support the implementation of this system, such as a PC (Personal Computer) and internet connection via Wifi.
2. Operational Feasibility: Kusuma Raya Junior High School has human resources who are skilled in using computers, so they can easily operate this system. easily operate this system
3. Economic Feasibility: Expenditure on the development of this system is quite efficient when viewed from the benefits obtained in the future, because this system uses the PHP programming language and software such as XAMPP and Visual Studio Code which are open-source. This provides benefits, especially in terms of saving time, cost, and energy in data processing carried out by the administration.

3.1. System Design

A system design that incorporates the subsequent phases is necessary to achieve the goals intended in the new design.

1. Examining, researching, and compiling the new system required to organize the existing system into a data structure for the system to be developed.
2. Carefully consider, and design the system by using all the information that will be generated.
3. Examine potential barriers that are considered when designing a new system.

4. Choose a design for the input and output procedures of the final program that will make it easy to identify and assess the various parts of the problem.

3.1.1. Context Diagram

The following is the Context Diagram of the Submission Decision Support System and Website-Based Scholarship Assessment

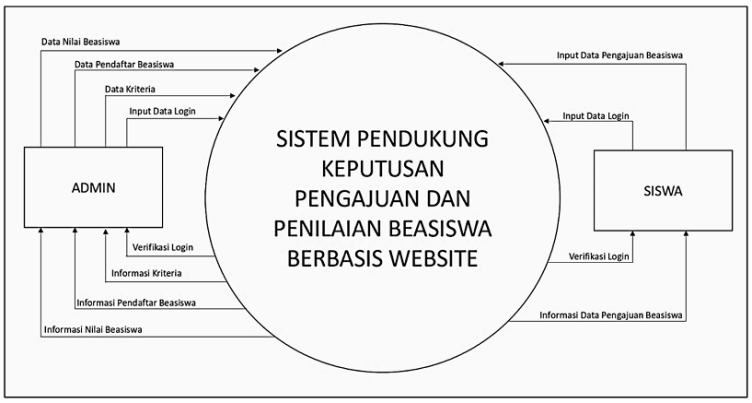


Figure 1. Context Diagram

Event List :

1. Admin inputs login data to access the system.
2. Admin manages scholarship value data, scholarship applicant data, and scholarship recipient data.
3. Admin gets information on scholarship application data for verification and decision process.
4. Students input login data to access the system.
5. Students input scholarship application data, which includes filling in personal data, and related documents.

Students get criteria information, scholarship applicant information, scholarship applicant information, and scholarship value information.

3.1.2. DFD Level 1

The following is DFD level 1 of the Decision Support System for Submission and Website-Based Scholarship Assessment.

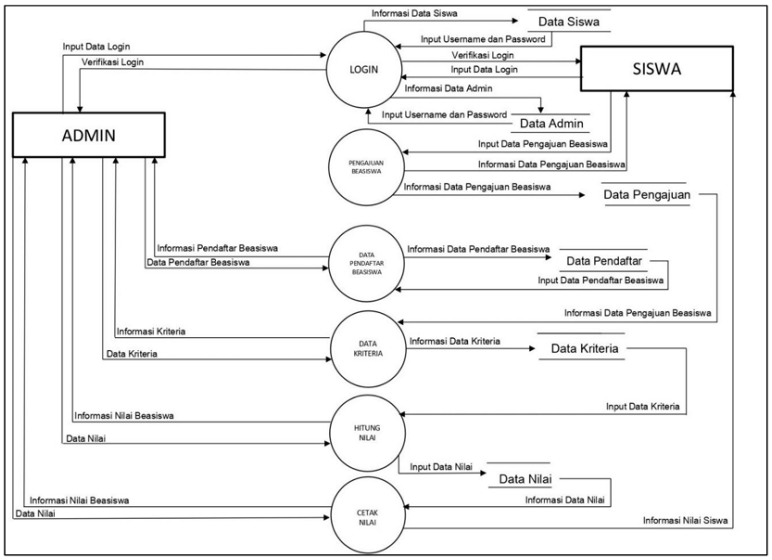


Figure 2. Data Flow Diagram Level 1

Event List:
1. Admin login by entering username and password to complete login verification.
2. Admin can view information on scholarship applicant data, including data on students who have applied for scholarships.
3. Admin can input criteria data for the scholarship selection process selection process.
4. Admin performs the scholarship value calculation process based on predetermined criteria.
5. Admin can also print the results of student score calculations.
6. Students login by entering their username and password to complete login verification.
7. Students input scholarship application data, then verified and managed by the system.
8. Students can view scholarship value information that is calculated based on criteria data managed by the admin.

3.1.2. ERD

The following is the ERD of the Decision Support System for Submissions and Website-Based Assessment as follows.

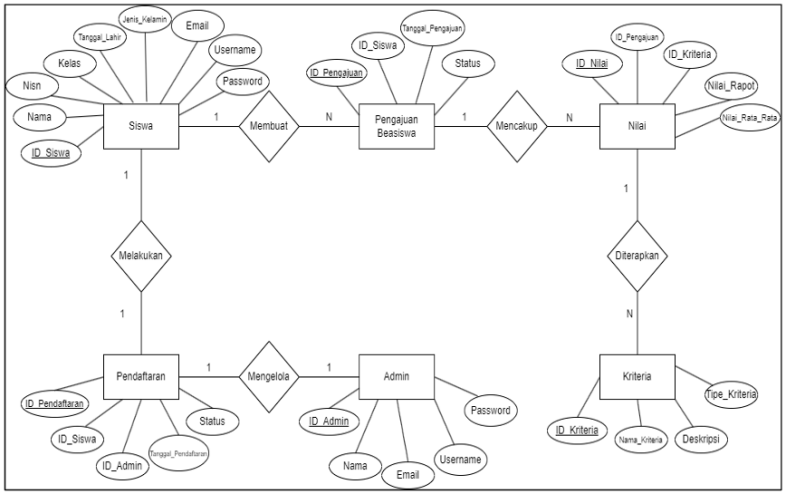


Figure 3. Entity Relational Diagram

The Entity-Relationship Diagram (ERD) above illustrates a Scholarship Application System consisting of six main entities: **Student (Siswa)**, **Scholarship Application (Pengajuan Beasiswa)**, **Score (Nilai)**, **Criteria (Kriteria)**, **Registration (Pendaftaran)**, and **Admin**. Each student has personal attributes such as student ID, name, class, NISN, birth details, email, username, and password. A student can perform a registration and create scholarship applications. Each application includes scores, which are evaluated based on specific criteria. The scores are linked to both the application and the criteria used. Criteria themselves contain a unique ID, type, and description. The registration process is managed by an admin, who also has identifying attributes like ID, name, email, username, and password. This system is designed to handle the process of student scholarship submissions, including score evaluations and administrative oversight.

3.2. Design View

Here are the results of the display of the Decision Support System for Submission and Website-Based Scholarship Assessment.

3.2.1. Design View of Login Options Page

This page functions as the primary welcome screen of the SMP Kusuma Raya Scholarship Management System, serving as the initial point of interaction for all users. Designed with clarity and usability in mind, it offers a clean and intuitive interface that guides users smoothly into the system. Both administrators and students are provided with distinct login options, enabling them to access features relevant to their respective roles. For administrators, the page acts as an entry to various system management tools, including scholarship data management, applicant evaluation, and report generation. Meanwhile, students can use this page to check scholarship information, submit required documents, and monitor the progress of their applications. The layout is organized to support efficient navigation and minimize confusion, especially for

first-time users. As the gateway to all scholarship-related processes, this welcome page plays a vital role in ensuring that every user has a professional, seamless, and productive experience while accessing the system.

Figure 4. Design View of Login Option Page

The design view that first appears when accessing this application which has a choice between admin or student login.

3.2.2. Design View of Admin Login Page

Admin login design display, this page contains username input and password that can be filled in by theadmin to proceed to the menu page.

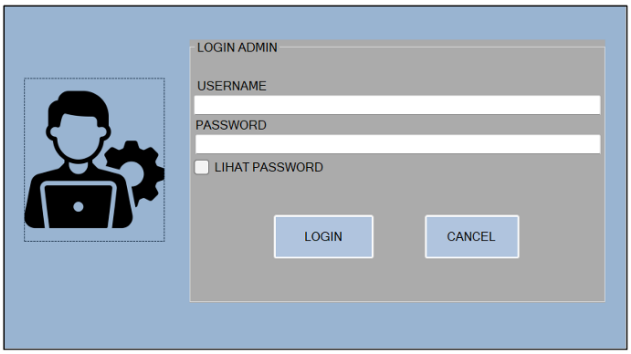


Figure 5. Design View of Admin Login Page

This page serves as the dedicated Admin Login interface for the SMP Kusuma Raya Scholarship Management System. It is specifically designed to provide secure access for system administrators, ensuring that only authorized personnel can enter the administrative dashboard and perform management-related tasks. To log in, administrators are required to enter their registered username and password in the designated input fields. The system includes built-in security measures to protect login credentials and prevent unauthorized access.

In addition to the basic login functionality, this interface offers user-friendly features to enhance the overall experience. One such feature is the "Show Password" option, which allows users to view the password they are typing, helping to reduce input errors. There are also two action buttons: "Login", which initiates the authentication process, and "Cancel", which allows the user to reset the form or return to the previous page if needed.

The design of the Admin Login page emphasizes clarity, simplicity, and security. It uses a clean layout that guides users effortlessly through the login process. Proper validation checks are also implemented to ensure that the input data meets the required format before access is granted. Overall, this page plays a critical role in maintaining system integrity by managing access control efficiently and ensuring that administrative functions are protected from misuse or unauthorized entry.

3.2.3. Design View of Student Login Page

Student login design display, this page contains input usernames and passwords that will be filled in by students to proceed to the menu page. to the menu page.

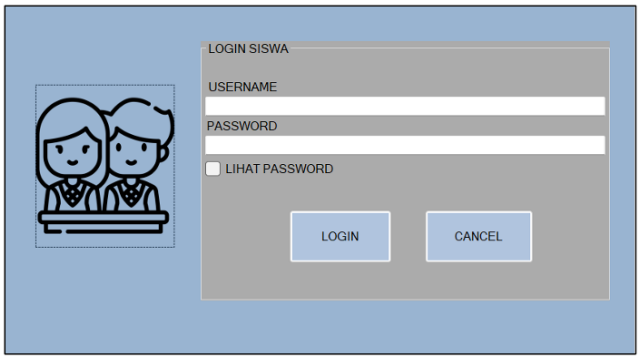


Figure 6. Design View of Student Login Page

This page is the Student Login interface of the system. It is designed for students to securely access their accounts by entering their username and password. To support ease of use, the page includes a 'Show Password' option and action buttons for logging in or canceling the process.

3.2.4. Display Design of Admin Dashboard Page

Design view of the admin dashboard page, which appears after admin login.

Figure 7. Display Design of Admin Dashboard Page

This is the main dashboard page for the Admin of the SMP Kusuma Raya system. It welcomes the user and provides quick access to key features such as Admin Data Input, Report Viewing, and Logout. This interface serves as the central control panel for managing system activities efficiently.

3.2.5. Design View of Student Dashboard Page

Design view of the student dashboard page, which appears after student login.

Figure 8. Design View of Student Dashboard Page

This is the main dashboard page for students in the SMP Kusuma Raya scholarship system. It provides access to key features such as Student Data Input, Scholarship Information, and Logout. This interface acts as a central hub for students to manage their scholarship applications and view related updates

3.2.6. Design View of Admin Input Page

Design view of the page that the admin will input.

Figure 9. Design View of Admin Input Page

This page represents the Admin dashboard menu in the SMP Kusuma Raya scholarship system. From this interface, administrators can access and manage key data components, including Student Data, Applicant Data, Criteria Data, and Score Data. The menu structure is designed to facilitate efficient navigation and data input within the system.

3.2.7. Design View of Student Input Page

Design view of the page that students will input.

Figure 10. Design View of Student Input Page

This page displays the student dashboard interface of the SMP Kusuma Raya scholarship system. Through this menu, students can access the 'Application Data' section to submit or manage their scholarship applications. The interface also provides navigation to scholarship information and a logout option, ensuring ease of use and organized access to essential features.

5.2.8. Design View of Scholarship Information Page

Design view of scholarship information that students see to choose which scholarship to apply for.

Figure 11. Design View of Scholarship Information Page

This **Scholarship Information** page provides students of SMP Kusuma Raya with details about various scholarship opportunities available to them. The interface displays three main scholarship programs: **Beasiswa Anak Teladan**, which rewards outstanding students with specific registration and implementation timelines; the **DataPrint Scholarship**, a private initiative that supports students by providing educational supplies; and the **Indonesia Smart Program (Program Indonesia Pintar)**, a government-run scholarship aimed at assisting underprivileged students in continuing their education. The page is designed to present information in a visually appealing and accessible way, encouraging students to explore and take advantage of available financial aid programs.

5.2.9. Design View of Report Page

Design view of the report page containing the score print.

Figure 12. Design View of Report Page

his **Report Page** serves as a key feature for administrators at SMP Kusuma Raya, allowing them to access and manage academic performance reports efficiently. The highlighted option, **"Cetak Nilai"** (Print Grades), enables users to generate and print student grade reports with ease. This functionality is designed to support the school's academic documentation process by providing quick access to well-organized and printable grade records, ensuring transparency and accuracy in academic reporting.

5.2.10. Design View of Student Data Input Page

Design view of the student data input page, which will be inputted by the admin.

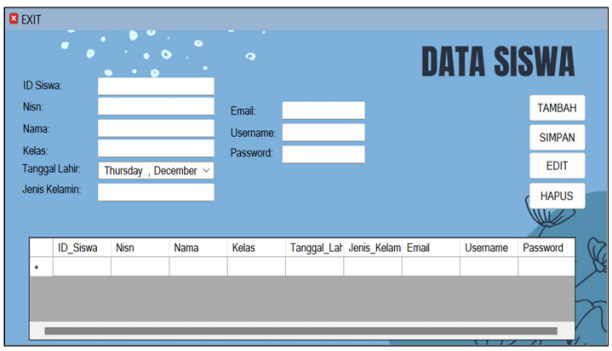


Figure 13. Design View of Student Data Input Page

This page is a student data management interface specifically developed to facilitate the efficient input, update, and maintenance of student information within the SMP Kusuma Raya Scholarship Management System. It serves as a central tool for administrators to ensure that all student records are complete, accurate, and up to date. The interface includes a structured form where users can input essential student details, including Student ID, NISN (National Student Identification Number), full name, class, date of birth, gender, email address, username, and password.

Each field is designed with proper labeling and formatting to minimize data entry errors and ensure consistency across the database. The interface supports key data management functions, which are conveniently located on the right-hand side of the form. These functions include Add, to input a new student record; Save, to store newly entered or updated data; Edit, to modify existing records; and Delete, to remove outdated or incorrect information.

Below the form, a dynamic data table displays all existing student records in an organized manner. This table allows users to view and verify the stored data, and also supports real-time updates, ensuring that changes made through the form are immediately reflected.

To enhance usability, the page may also include features such as search and filter options, enabling users to quickly locate specific student records based on certain criteria. This interface plays a critical role in the overall system by maintaining an accurate and comprehensive database of students, which is essential for scholarship eligibility verification, application tracking, and report generation. Designed with usability and functionality in mind, it ensures that administrators can manage student data with ease and reliability.

5.2.11. Display Design of Registrant Data Input Page

The design view of the registrant data input page, which will be inputted by the admin.

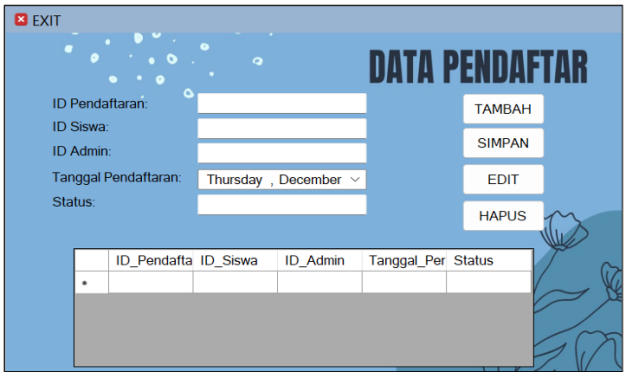


Figure 14. Display Design of Registrant Data Input Page

This page serves as the registration data interface, providing a structured platform for managing and recording student registration details in the system. It includes clearly labeled input fields such as Registration ID, Student ID, Admin ID, Registration Date, and Registration Status to ensure accuracy and consistency. The interface allows users to perform essential actions, including adding new records, saving changes, editing existing entries, and deleting incorrect or outdated data. All registration records are displayed in a table located below the form, enabling users to easily review, search, and verify data. This interface ensures efficient and organized registration tracking.

5.2.12. Design View of Criteria Data Input Page

Design view of the criteria data input page, which will be inputted by the admin.

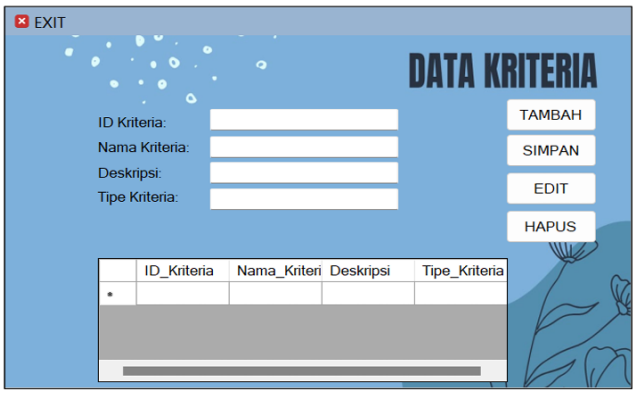


Figure 15. Design View of Criteria Data Input Page

This page is a criteria data management interface designed to facilitate the input, organization, and maintenance of various evaluation criteria used in the scholarship selection process. Users can enter essential details such as Criteria ID, Criteria Name, Description, and Criteria Type, ensuring each criterion is clearly defined and categorized. The interface provides key action buttons on the right side, including Add, Save, Edit, and Delete, allowing users to efficiently manage the list of criteria. All entered data is automatically displayed in the table below, enabling easy review, updating, and verification of existing criteria. This

interface plays a crucial role in maintaining consistent and accurate evaluation standards throughout the selection process.

5.2.13. Design View of the Grade Data Input Page

Design view of the value data input page, which will be inputted by admin.

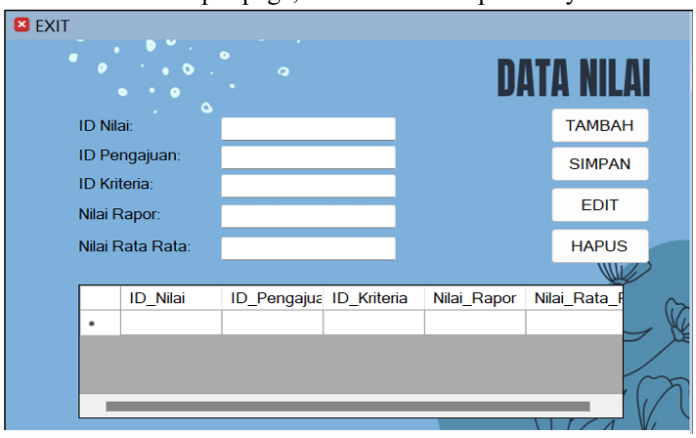


Figure 16. Design View of The Grade Data Input Page

This page functions as a score data management interface developed to record, organize, and maintain student scores based on predefined evaluation criteria. Users can input important information such as Score ID, Submission ID, Criteria ID, Report Card Score, and Average Score, ensuring that each student's performance is accurately assessed. The interface includes essential control buttons—Add, Save, Edit, and Delete—that allow users to efficiently manage the score records. These features enable the system to keep track of all score-related data with consistency and precision. The entered data is displayed in a dynamic table below the form, making it easy to view, review, and modify score entries as needed. This page plays a critical role in supporting transparent and organized evaluation processes by ensuring that all student assessments are properly documented and accessible. The layout is designed for ease of use, allowing administrators to manage scoring activities with clarity and efficiency.

5.2.14. Design View of Submission Data Input Page

The design view of the submission data input page, which will be inputted by students.

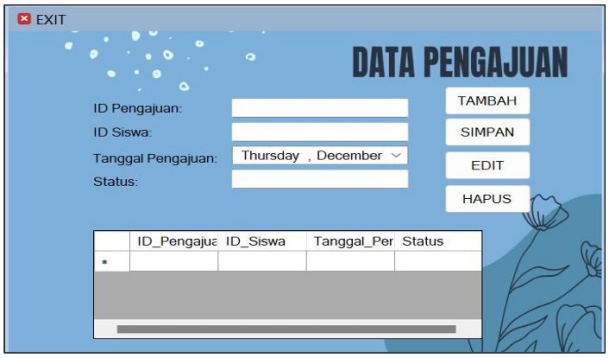


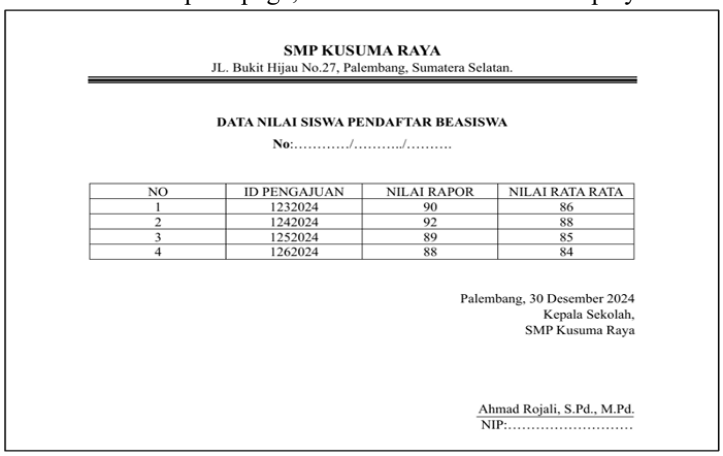
Figure 17. Design View of Submission Data Input Page

This page serves as a submission data management interface that enables users to input, update, and organize student submission records efficiently. It features several key fields, including Submission ID, Student ID, Submission Date, and Submission Status, which help ensure that each record is complete and accurately reflects the student's application progress. The interface provides essential action buttons—Add, Save, Edit, and Delete—located on the right side, allowing users to manage the data with ease. These controls support the smooth handling of new entries, modifications, and deletions of outdated or incorrect records. All submission data is automatically displayed in a structured table below the form, making it easy to monitor and verify each student's submission status. This interface is essential for tracking the overall progress of scholarship applications and ensuring that all required documents and information are submitted

in a timely manner. Designed for clarity and usability, the page supports efficient data handling and contributes to a well-organized administrative workflow.

5.2.15. Design View of Grade Print Page

The design view of the score print page, and also the final result display that will output the score.



SMP KUSUMA RAYA
JL. Bukit Hijau No.27, Palembang, Sumatera Selatan.

DATA NILAI SISWA PENDAFTAR BEASISWA
No:...../...../.....

NO	ID PENGAJUAN	NILAI RAPOR	NILAI RATA RATA
1	1232024	90	86
2	1242024	92	88
3	1252024	89	85
4	1262024	88	84

Palembang, 30 Desember 2024
Kepala Sekolah,
SMP Kusuma Raya

Ahmad Rojali, S.Pd., M.Pd.
NIP:.....

Figure 18. Design View of Grade Print Page

This page presents a printed report format specifically designed to display the academic scores of students applying for scholarships at SMP Kusuma Raya. It serves as an official document summarizing important information such as the Submission ID, individual report card scores, and the calculated average score for each student. The layout is structured for clarity and readability, ensuring that all relevant data is accurately represented and easy to review. This report plays a crucial role in the scholarship evaluation process, providing a standardized format for decision-making and documentation purposes. Additionally, the document includes a designated area for official numbering and the date of issuance, which helps maintain proper administrative records. To ensure its legitimacy, the report is formally signed by the school principal, confirming the authenticity and approval of the academic information contained within. This format is intended for both internal use and potential submission to external education or funding bodies as part of the scholarship verification process.

2. Conclusion

Conclusion regarding the Decision Support System for Submission and Website-Based Scholarship Assessment as follows.

1. The system that has been designed and developed successfully provides solution to problems in the selection process of scholarship recipients at Kusuma Raya Junior High School. The manual process takes a long time and has risk of objectivity. Through this website-based system, the selection process becomes easier, and more efficient. The TOPSIS method applied in This system is able to assist in decision making by comparing and comparing and assessing applicants based on predetermined criteria, such as academic grades, parents' income, and extracurricular achievements. The resulting evaluation results are fairer because they are based on based on objective mathematical calculations.
2. With website-based technology, this system can be accessed wherever and whenever needed by interested parties. Thus convenience, especially for students who wish to apply for a scholarship and monitor the status of their application. The use of this system is able to save time and resources compared to the manual process. Admin only need to input the data once, and the system will process the data automatically to produce a ranking of scholarship recipients. automatically to generate a ranking of scholarship recipients. With this, admin work becomes lighter.
3. The design of this system is focused on ease of use, both for the admin and students. Features such as login, data entry, and assessment are done with a simple and easy-to-understand interface.

Acknowledgement

Praise be to God Almighty for His mercy and grace, so that I can complete the final project report entitled "Website-Based Scholarship Application and Assessment Decision Support System Using the TOPSIS Method at Kusuma Raya Junior High School". The preparation of this report cannot be separated from the help, support, and guidance of various parties who have made valuable contributions.

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