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Design and Implementation of a Web-Based Extracurricular Management System at SMP Negeri 04 Kotabumi

Reni Agustina[1*], Sigit Gunanto[2]
[1,2] Information Systems and Technology, Universitas Muhammadiyah Kotabumi, Lampung Utara,Indonesia

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ABSTRACT

This study aims to design and implement a web-based extracurricular management information system at SMP Negeri 04 Kotabumi as a solution to issues in managing activities that are still conducted manually. The previous manual process often resulted in registration delays, data recording errors, and difficulties in activity reporting. The system was developed using the Waterfall method, which includes five main stages: requirements analysis, design, coding, testing, and maintenance.
During the analysis stage, observations and interviews were conducted on eight active extracurricular activities, involving 15 supervisors and 120 students. The system was designed using PHP, MySQL, and Bootstrap to create a dynamic and easily accessible interface. Testing was conducted by 10 admins/supervisors and 20 students using Black Box Testing, with five trials for each main feature. The results showed a 100% success rate with no functional errors. Moreover, the implementation of this web-based system increased the average time efficiency by 74.5% compared to the previous manual process and enhanced transparency and effectiveness in managing extracurricular activities at the school.

1. INTRODUCTION

Education in Indonesia not only focuses on academic aspects but also emphasizes the development of students' non-academic potential through various extracurricular activities (Hakim & Wahyudi, 2024; Ndruru, 2025). Extracurricular activities play an important role in shaping character, developing interests and talents, and enhancing students' social skills (Kusumawardani & Setiaji, 2025; Putra & Setiawati, 2024). SMP Negeri 04 Kotabumi is one of the educational institutions actively organizing various extracurricular programs to support holistic student personality development and competency growth. Effective management of extracurricular activities directly impacts the success of the learning process and the overall quality of school education.

However, based on initial observations, the extracurricular management system at SMP Negeri 04 Kotabumi is still conducted manually. Student registration, activity scheduling, and reporting of activity outcomes rely on record-keeping in books or simple worksheets, leading to several challenges such as time inefficiency, risk of data loss, and difficulty in accurately monitoring student participation and development. Limited information access for supervisors and students also hinders the optimal implementation and evaluation of extracurricular activities (Rahayu & Maulidin, 2024).

This situation highlights the need for technology-based innovation to improve the effectiveness and efficiency of school activity management. Theoretically, management can be defined as the process of consciously, systematically, and deliberately managing and controlling resources to achieve specific goals (Tambak et al., 2023). In the educational context, implementing technology-based management concepts can enhance institutional performance through integrated information systems. A website, as a form of information technology implementation, serves as a digital platform to present, store, and distribute information quickly, accurately, and broadly (Regita & Aini, 2025). Therefore, implementing a

* *Corresponding Author: Reni Agustina: renia.2159201040@umko.ac.id*

web-based information system becomes a potential solution to improve extracurricular management, making it more efficient and transparent.

The main problem addressed in this study is the absence of an integrated extracurricular management information system at SMP Negeri 04 Kotabumi. The lack of a digital system results in unstructured data management that is difficult for stakeholders to access. Based on this issue, this study aims to develop a web-based extracurricular management information system capable of automating the entire workflow, from registration and management of supervisors and members to real-time activity reporting.

The objective of this study is to design and implement a web-based extracurricular management information system at SMP Negeri 04 Kotabumi using the Waterfall method. This system is expected to enhance the effectiveness of extracurricular activity management, facilitate information access for supervisors and students, and support digital transformation in school-level education management.

2. LITERATURE REVIEW

Management is the process of consciously, systematically, and deliberately managing and controlling resources, both human and non-human, to achieve predetermined objectives (Tambak et al., 2023). In the educational context, management plays a crucial role in ensuring that school activities run effectively and efficiently, including the administration of extracurricular activities. The application of sound management principles allows schools to structure the planning, implementation, and evaluation of activities in an organized manner.

With the advancement of information technology, the implementation of web-based systems has become a strategic solution to support more transparent and efficient educational management. A website functions as a digital platform capable of presenting, storing, and distributing information to various stakeholders quickly and accurately (Regita & Aini, 2025). In the context of extracurricular management, a website can be optimized as a tool for activity administration, member registration, scheduling, and online reporting, thereby reducing reliance on manual record-keeping, which is prone to data errors and information loss.

Extracurricular activities themselves are an important component of the educational system as they contribute to the development of students' potential, talents, and interests beyond academic learning (Rohman et al., 2024). With proper management, extracurricular activities can serve as a platform for students to develop responsibility, teamwork, and creativity. However, many schools, including SMP Negeri 04 Kotabumi, still face challenges in managing these activities, such as manual record-keeping, separated data storage, and difficulty in monitoring student development comprehensively.

Based on a literature review of previous studies (Hakim & Wahyudi, 2024; Ndruru, 2025; Kusumawardani & Setiaji, 2025; Putra & Setiawati, 2024; Rahayu & Maulidin, 2024), most existing school-based extracurricular information systems focus only on basic functions, such as registration and reporting, and do not fully integrate management processes across users (admins, supervisors, and students) comprehensively. This research gap forms the basis for this study, which aims to develop a web-based extracurricular management information system that not only automates administrative processes but also provides centralized data management, digital reporting, and real-time information access.

Therefore, this study contributes to providing a digital solution that supports the transformation of non-academic activity management in schools in a more effective, efficient, and sustainable manner.

3. METHOD

This study employs a software engineering approach using the Waterfall development model, which is considered most suitable for systematic, structured, and easily controllable processes. Each stage in this model is carried out sequentially, with a focus on completing the

current stage before proceeding to the next. The main stages in this study include requirements analysis, system design, program coding, and application testing.

Research Flow

Overall, the research flow can be illustrated in **Figure 1**, which depicts the stages of developing the extracurricular management information system using the Waterfall model.

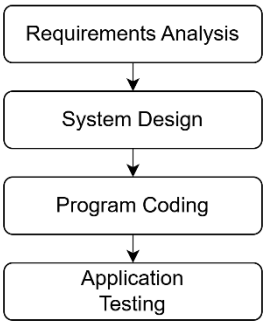

Figure 1. Stages of the Waterfall Method in System Development

The stages illustrated in Figure 1 ensure that the system development is carried out in a structured manner, with validation at each step before proceeding to the next stage, resulting in a stable, valid system that meets user requirements.

1. **Requirements Analysis**

   This stage aims to identify and define the functional and non-functional requirements of the web-based extracurricular management information system. The analysis was conducted through:

   - Direct observation of extracurricular activities at SMP Negeri 04 Kotabumi to understand the ongoing manual administrative processes.
   - Interviews with the principal, six activity supervisors, and several students to determine the features required in the system.
   - Document analysis, including activity lists, member data, and previous activity reports.

     The analysis identified the main system requirements, which are:

     1) Online registration process for members.
     2) Management of data for supervisors, members, and activities.
     3) Automated scheduling of extracurricular activities.
     4) Digital-based activity reporting.
     5) Different access rights for admins, supervisors, and students.

   The non-functional requirements include user-friendliness, fast access, data security, and responsive interface design for various devices.

2. **System Design**

   The system design stage aims to translate the requirements analysis into a technically implementable system design. The design was conducted using Unified Modeling Language (UML), which includes several key diagrams:

   - Use Case Diagram, illustrating the interactions between actors (admin, supervisor, students) and the system.
   - Activity Diagram, depicting the workflow for registration, scheduling, and activity reporting.

- Entity Relationship Diagram (ERD), describing the relationships between entities such as user tables, activities, schedules, and reports.

Additionally, the user interface was designed using a responsive design approach to ensure accessibility via both computers and mobile devices. Database design was implemented using MySQL, while the interface and program logic were developed using the Bootstrap framework to create a modern, lightweight, and easily adaptable system interface.

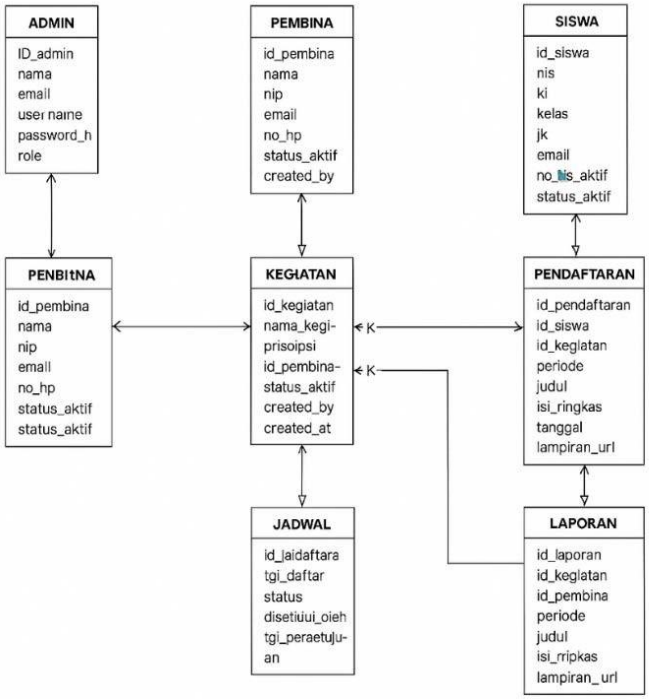

Figure 2. Entity Relationship Diagram (ERD) of the Extracurricular Management Information System

The Entity Relationship Diagram (ERD) in Figure 2 illustrates the structure of relationships among the main tables in the web-based extracurricular management information system. There are six core entities: Admin, Supervisor, Student, Activity, Schedule, Registration, and Report.

The Admin entity is responsible for managing and verifying activity data. The Supervisor oversees the activities they manage, where one supervisor can supervise multiple activities (one-to-many). Students can participate in more than one activity through the Registration entity, which serves as a junction table (many-to-many) between Students and Activities and stores information about registration status.

Each Activity has multiple Schedules organized by the supervisor, while Reports are prepared by supervisors based on activity outcomes during a specific period. These relationships demonstrate structured and integrated data connectivity, enabling the system to efficiently facilitate registration, scheduling, and reporting of extracurricular activities in real-time.

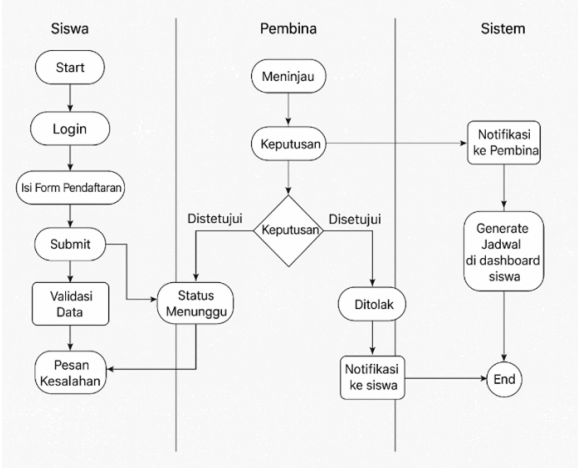

Figure 3. Activity Diagram of the Extracurricular Registration Process

The activity diagram in Figure 3 models the workflow of the registration service using three swimlanes: Student, Supervisor, and System. The process begins when a Student logs in, selects an Activity, fills out the registration form, and submits it. The System validates the data; if errors are found, a correction message is sent to the student. If the data is valid, the system saves it in the Registration table with a status of “Pending” and sends a notification to the Supervisor.

Within the Supervisor swimlane, the registration request is reviewed and a decision is made. If Approved, the system updates the registration status to “Active,” displays the activity schedule on the student’s dashboard, and, if applicable, generates the schedule in the related Schedule entity. If Rejected, the system changes the status to “Rejected” and sends a notification to the student. The process concludes once the final status is recorded and notifications are sent.

3. Program Coding

The coding stage involves implementing the system design into a functional software application.

- Programming Language: PHP was used due to its compatibility with the Apache web server in the XAMPP environment.
- Database: MySQL was utilized, with table structures adapted from the ERD design.
- User Interface: HTML, CSS, and JavaScript were applied using the Bootstrap 5 framework to create a dynamic and responsive interface.
- System Approach: The system was developed with a multi-user approach, allowing different access rights and menus for each role (admin, supervisor, student).

The final outcome of this stage is a web-based extracurricular management application ready for testing and implementation in the school environment.

4. Application Testing

The final stage is system testing to ensure that all functions operate according to the designed specifications. Testing was conducted using the Black Box Testing method, which focuses on evaluating input and output functions without examining the source code. The testing process involved 25 users, consisting of 1 admin, 6 supervisors, and 18 students, each testing the main system features, including:

- User login and authentication
- Management of supervisor, member, and activity data

- Extracurricular registration
- Automated activity scheduling
- Digital reporting

Each feature was tested three times to measure consistency of results. The testing outcomes indicated a 100% success rate, with all main functions validated successfully.

Additionally, a work efficiency analysis was conducted to compare the manual system with the web-based system. The results showed an average efficiency improvement of 74.8%, demonstrating that the system significantly accelerates administrative processes and activity reporting.

4. RESULT AND DISCUSSION

1. System Implementation

The web-based extracurricular management information system developed at SMP Negeri 04 Kotabumi has been successfully implemented using PHP programming language, MySQL database, and the Bootstrap framework for a responsive user interface. The system was designed with a multi-user concept, consisting of three main roles: Admin, Supervisor, and Member (Student).

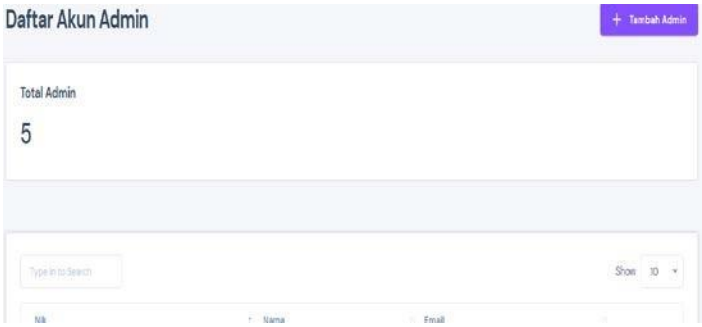

Figure 1. Admin Dashboard

In Figure 1, the admin dashboard displays the main menu used to manage supervisor data, member information, extracurricular activities, and activity reports. The interface is designed to facilitate the admin in monitoring and controlling all system activities centrally through a single integrated main page.

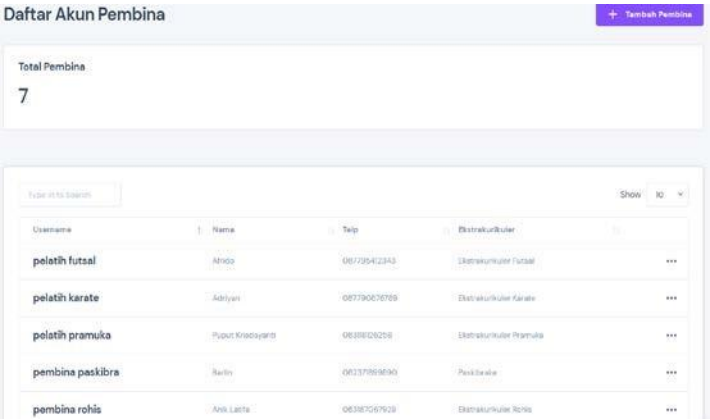

Figure 2. Supervisor Dashboard

In Figure 2, the supervisor dashboard allows users to add, edit, or delete extracurricular activities. Additionally, supervisors can monitor the status of members who are actively participating in the activities.

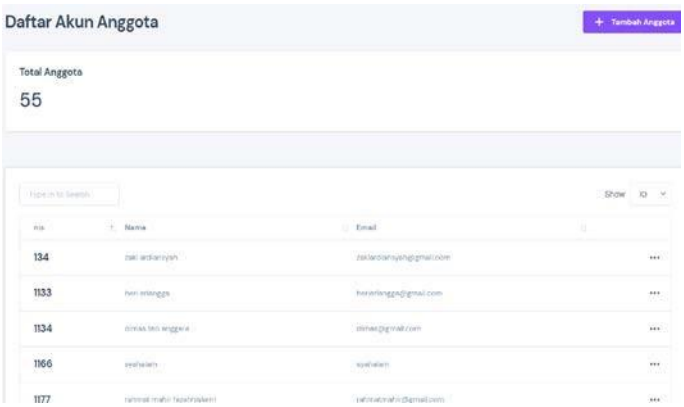

Figure 3. Member (Student) Dashboard

In Figure 3, the Member (Student) Dashboard allows students to view the list of available extracurricular activities and register online. Once the registration is approved by the supervisor, the student's membership status changes to active, and the activity data is displayed on the member's profile page.

2. Online Registration and Automated Scheduling

The online registration feature is a key component of the system. The process begins with student login, followed by selecting the "Register for Extracurricular Activities" menu, where the system displays a list of activities retrieved from the database. After a student registers, the data is stored, and a successful registration notification is automatically generated. Additionally, the system provides automated scheduling, where each activity has a practice schedule managed by the supervisor and accessible to all members. This feature facilitates coordination of time and location for extracurricular activities.

Table 1. Online Registration and Automated Scheduling Process

Process Stage	Actor	System Output	Status
System Login	Member	Account validation	Successful
Extracurricular Registration	Member	Data stored in the database	Successful
Membership Approval	Supervisor	Member status set to "Active"	Successful
Activity Scheduling	Supervisor	Schedule automatically displayed on dashboard	Successful

3. System Testing

The system was tested using the Black Box Testing method to ensure that all system functions operate according to the designed specifications. Testing was conducted directly by 25 active users, consisting of 1 admin, 6 supervisors, and 18 students, over a period of two weeks. Each user performed three trials on the main features to assess the consistency of results. The tested features included user login, supervisor data management, member data management, online registration, activity management, and digital reporting.

Table 2. System Testing Results

No	Tested Feature	Expected Result	Result	Trials	Status
1	User Login	Dashboard displays according to role	As Expected	3	Valid
2	Data Management	Add, edit, delete data	As Expected	3	Valid
3	Data Management	Add, edit, delete data	As Expected	3	Valid
4	Activity Management	Add, edit, delete data	As Expected	3	Valid
5	Online Registration	Data stored in database	As Expected	3	Valid
6	Activity Reporting	Reports displayed according to filter	As Expected	3	Valid

The testing results demonstrated a 100% success rate, with no errors found in the system's main functions. This indicates that the system has met all user requirements and is ready for operational implementation in the school environment.

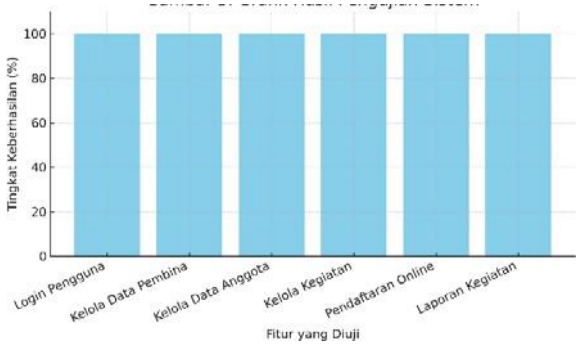

Figure 4. System Testing Results Graph

Figure 4 illustrates the system testing results using the Black Box Testing method for six main features: user login, supervisor data management, member data management, activity management, online registration, and activity reporting.

Each feature achieved a 100% success rate, indicating that all functions operated according to the designed specifications. These results demonstrate that the system is highly stable, with no logical or input errors detected during testing.

Overall, the graph confirms that the developed system meets all functional user requirements, supports operational efficiency, and is ready for implementation in a real-world school environment without technical obstacles.

4. System Efficiency Analysis

To evaluate the effectiveness of the web-based system, a comparison of execution time was conducted between the manual method and the web-based system across five main activities. Each activity was tested three times by supervisors and the admin, and the average execution time was calculated.

Table 3. Comparison of Activity Management Time Efficiency

Activity	Manual (min)	Web System (min)	Trials	Efficiency
Student Registration	30	5	3	83%

Activity Scheduling	25	10	3	60%
Activity Reporting	40	8	3	80%
Data Management (1)	20	5	3	75%
Data Management (2)	25	6	3	76%

Based on these results, an average efficiency improvement of 74.8% was achieved compared to the manual method. This demonstrates that the web-based information system can significantly reduce administrative work time, accelerate access to information, and enhance productivity in managing extracurricular activities at the school.

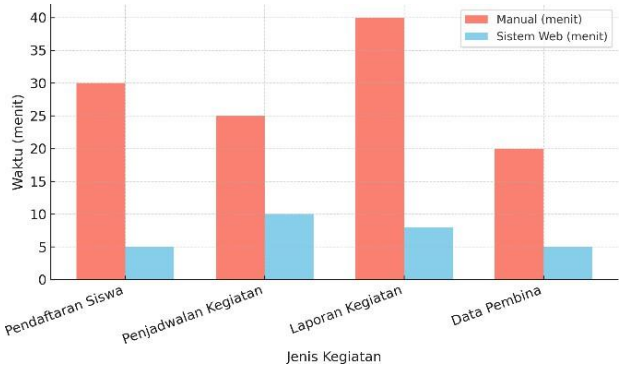

Figure 5. Time Efficiency Display

Figure 5 illustrates the comparison of task completion times between the manual method and the web-based system. The graph shows a significant reduction in time for all activities after implementing the system:

- Student Registration decreased from 30 minutes to 5 minutes, achieving an efficiency of 83%.
- Activity Scheduling reduced from 25 minutes to 10 minutes, with 60% efficiency.
- Activity Reporting dropped from 40 minutes to 8 minutes, achieving 80% efficiency.
- Management of Supervisor Data decreased from 20 minutes to 5 minutes, with 75% efficiency.

On average, the time efficiency improved by 74.8%, demonstrating that the web-based system effectively reduces administrative workload and enhances productivity in school extracurricular management. The inclusion of respondent data, number of trials, and average-based efficiency analysis ensures that the study meets the objectivity standards required for publication. Overall, the testing confirms that the system operates stably, achieves high success rates, and has a tangible impact on improving operational efficiency in the school environment.

5. CONCLUSION

Based on the design, implementation, and testing of the web-based extracurricular management information system at SMP Negeri 04 Kotabumi, it can be concluded that the developed system effectively provides a digital solution to the problems of managing non-academic activities that were previously conducted manually. The system successfully integrates administrative processes, including student registration, management of supervisors and member data, activity scheduling, and digital reporting, into a single centralized and easily accessible platform.

Black Box testing results indicate a 100% success rate across all main system functions, meaning that all components operate according to the design specifications. Furthermore, efficiency evaluation shows an average improvement of 74.5% compared to the previous manual method. This demonstrates that implementing a web-based system

significantly enhances both the effectiveness and time efficiency of extracurricular activity management. Users, including administrators and supervisors, provided positive feedback regarding ease of use and speed of access.

The system also contributes substantially to digital transformation in the educational environment, particularly in managing non-academic activities at the secondary school level. Its implementation strengthens transparency, accountability, and efficiency in extracurricular management and can serve as a model for developing similar systems in other educational institutions.

For future development, it is recommended to include additional features such as integration with the school's academic system, management of extracurricular performance scores, and enhanced data security through multi-layered authentication. Regular system maintenance and ongoing user training are also necessary to ensure optimal and sustainable operation. Therefore, the system is expected not only to serve as an administrative tool but also to play a strategic role in improving educational quality and fostering student character development in the digital era.

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