# Design and Development of a Web-Based High School Information System

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***Abstract***

*The rapid development of information technology has had a significant impact on various fields, including education. This study aims to design and develop a web-based school information system for SMK Negeri 1 Sorong to enhance efficiency in data management and the dissemination of academic and non-academic information. The methodology used follows the Waterfall system development model, which includes requirements analysis, system design, implementation, testing, and maintenance. The research results indicate that the system, developed using PHP as the programming language and MySQL as the database, operates stably and provides users with flexible access. This system facilitates the integration of student data, teacher data, class schedules, and other related information. Testing confirmed that all system functions operate according to the designed specifications. With the implementation of this system, SMK Negeri 1 Sorong can improve the quality of educational services, simplify information access, and support digital transformation in the education sector. Furthermore, the results of this study have the potential to be applied and adapted in other educational contexts, particularly in the development of web-based school information systems that can be customized according to the needs of other educational institutions.*

***Keywords***— School Information System, Web, SMK Negeri 1 Sorong.

## 1. INTRODUCTION

Information technology's rapid advancement has significantly impacted various sectors, including education [1]. Technological advancements influence various aspects of life, particularly in education, by facilitating the learning process and enhancing efficiency in education management [2]. In the rapidly evolving digital era, challenges in the field of education have become increasingly complex [3]. Web-based information systems have become one of the widely adopted solutions to enhance data management efficiency and services in educational institutions [4]. A website is one of the key information technologies that enables rapid information exchange between users through the internet. Various institutions have utilized this technology as a means of disseminating information and promoting their services. One example is the use of websites by educational institutions such as schools [5]. In the digital era, schools are required to adopt technology to meet the needs of a society that increasingly prioritizes quick and accurate access to information [6].

However, despite the benefits of integrating information technology into education, several challenges persist. One major challenge is the disparity in infrastructure availability, particularly in remote or underprivileged areas where internet connectivity and access to digital tools remain limited. Additionally, some schools face resistance to adopting new technologies due to factors such as a lack of technical expertise among educators and staff, as well as concerns regarding data security and privacy [7]. These challenges can hinder the effective implementation of web-based information systems in educational institutions.

Information technology is not only used to support data management but also serves as a communication medium between schools and the wider community. Integrated information technology enables educational institutions to be more responsive to the needs of users, including students, parents, and teachers. This makes web-based information systems an essential tool for supporting transparency, efficiency, and accuracy in the information delivered by schools. Additionally, a website can serve as a platform to showcase the school's profile and its flagship programs to the public. Addressing the challenges associated with adopting these technologies is crucial to maximizing their potential benefits and ensuring equitable access to digital education solutions.

Moreover, the ongoing digital transformation encourages educational institutions to adapt to the needs of the times. In this context, the development of web-based information systems in vocational high schools (SMK) not only supports the operational efficiency of schools but also serves as a strategy to create a more modern and relevant learning experience for students. Through this technological integration, schools can expand the reach of information, provide better services, and establish a technology-driven learning environment.

Vocational high schools (Sekolah Menengah Kejuruan - SMK), as one of the levels of vocational education, need to provide integrated academic and non-academic information [8][9]. With a web-based information system, various processes such as managing student and teacher data, class schedules, and delivering information to the public can be carried out more efficiently [10]. A web-based system also provides greater access flexibility, as it can be accessed anytime and anywhere through devices connected to the internet [11] [12].

Currently, many schools, including SMK Negeri 1 Sorong, do not have a web-based school information system, which presents several challenges. Without such a system, teachers and students struggle to efficiently access school schedules and announcements, while parents and the community have limited access to real-time updates on their children's activities at school. This inefficiency hinders effective communication and decision-making among stakeholders. Therefore, a web-based information system is essential to address these issues and enhance overall school operations. SMK Negeri 1 Sorong is one of the leading schools in Sorong and its surrounding areas, attracting a large number of students each year who aspire to continue their secondary education at this institution [13].

This research aims to design and develop a web-based school information system for SMK Negeri 1 Sorong, focusing on enhancing data management, improving accessibility for stakeholders, and streamlining administrative processes. This system is expected to help deliver school information efficiently, improve service quality, and support digital transformation in the educational environment. A study by Wisesa and Hariyati at SD Negeri Asemrowo 2 Surabaya found that a web-based school information system improved the speed and accuracy of information dissemination, enhancing administrative efficiency [14]. Similarly, research at SMKN 10 Semarang in 2023 validated a web-based school management system as effective, practical, and efficient, leading to better data management and decision-making processes [15]. Furthermore, Mulyadi et al. implemented a web-based system for managing student tuition payments using the Agile Development method, which increased efficiency and accuracy in financial administration. These findings demonstrate that web-based information systems significantly enhance the efficiency of school management in Indonesia [16].

## 2. RESEARCH METHODS

The research method used in this study is a system development method that involves several stages based on the Waterfall model. This model was chosen because it has structured stages and is suitable for web-based software development [17].

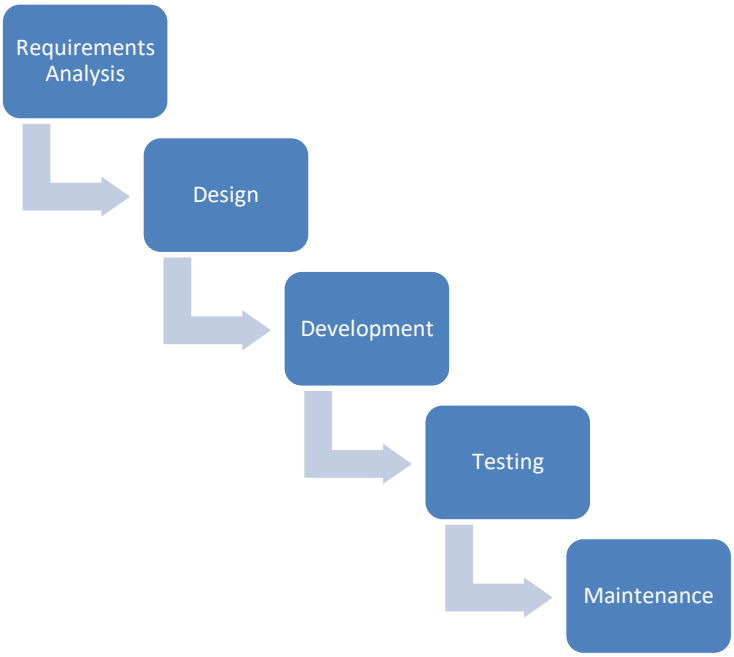


*Figure 1. Stages of the Waterfall Model*

The stages carried out in this research are as follows (with self-made Figure 1):

1. Requirements Analysis
   In this stage, system requirements were identified by collecting data through interviews, observations, and document studies at SMK Negeri 1 Sorong. This requirements analysis aims to identify the existing problems in school information management and determine an appropriate web-based solution.
2. Design
   Based on the results of the requirements analysis, a web-based information system was designed, including database design, user interface design, and system flowcharts. The system design was created using a user-centered design approach to ensure ease of use for the users.
3. Development
   After designing and testing the application, it was prepared for deployment using web hosting services, which play a crucial role in ensuring the application's usability and performance. Web hosting allows the website or web application to be stored on a server and accessed through various devices, such as desktop computers, mobile phones, and tablets, enabling the system to be widely accessible [18]. The system was developed using PHP 5.6.30, MySQL database, and Visual Studio Code as an Integrated Development Environment (IDE) on a Windows 11 environment, utilizing XAMPP as a local server during testing. The front-end design was implemented using Bootstrap to enhance the user interface and responsiveness. This stage involved coding based on the specifications that had been designed [19].
4. Testing
   The system was tested using the Black-Box Testing method, which focuses on functionality testing without examining the source code. This testing includes the following scenarios:
   - Admin Login: Only users with valid credentials can access the admin dashboard. Only users with an admin-level role can access the dashboard; otherwise, they will be redirected to the login page.

- Student and Teacher Data Management: Testing the addition, editing, and deletion of student and teacher data to ensure there are no input errors or data loss.
- Public Information Display: Ensuring that news, announcements, and school schedules can be accessed correctly by general users.
- System Security: Testing whether the system can handle invalid inputs, such as SQL Injection, by encrypting user password data.
- The test results show that all features function according to the designed specifications.

5. Maintenance

   This stage is carried out to ensure the system runs smoothly after implementation. Maintenance involves several key activities, including bug fixes, feature enhancements, and technical support. Bug fixes are managed through a structured issue-tracking system, where reported errors are categorized, prioritized, and resolved through patches or updates. Feature enhancements are implemented based on user feedback and system performance analysis, following a structured development and testing process before deployment. Technical support is provided by the system administrator, who handles user inquiries, troubleshooting, and system monitoring to ensure ongoing stability and efficiency.

This method is designed to ensure that the web-based information system developed can meet the needs of SMK Negeri 1 Sorong and provide an effective solution to the existing problems.

## 3. RESULT AND DISCUSSION

In the stage of developing the web-based information system implemented at SMK Negeri 1 Sorong, several significant results were found along with the implementation of this technology. The developed system aims to simplify access to academic and non-academic information for students, teachers, and parents. Below are the results obtained, along with an analysis of the successes and challenges encountered during the development of this system.

1. Optimization Results

   a. System Development and Technology Implementation

      The developed system uses the PHP programming language and MySQL database to ensure stability and optimal performance. This system utilizes a MySQL database with several main tables [20]. The tbl_user table stores user information, including id_user, username, password, *nama_pengguna*, level, *id_guru*, code, and verify. The *tbl_guru* table contains teacher data with columns such as *id_guru*, *nama_guru*, NIP, *foto, proli*, and status. The *tbl_prodi* table records study program details, including *id_prodi*, *nama_prodi*, *singkatan_prodi*, *profil_prodi*, and status. Meanwhile, the *tbl_eskul* table manages extracurricular activity data with columns like *id_eskul*, *nama_eskul*, *keterangan*, and status. Additionally, the *tbl_informasi* table stores various information with fields such as *id_informasi*, *tgl_informasi*, *judul_informasi*, *isi_informasi*, *id_pengguna*, *foto_informasi*, and *status_informasi*. Announcements are kept in the *tbl_pengumuman* table, which includes *id_pengumuman*, *tgl_pengumuman*, *isi_pengumuman*, and status. Job vacancy information is managed within the *tbl_loker* table, which consists of *id_loker*, *keterangan*, *foto*, and status. Infrastructure data is stored in the *tbl_sapras* table, including *id_sapras*, *nama_sapras*, total, *satuan*, and *kondisi*. The system also includes the *tbl_tautan* table for important links, with columns *id_tautan*, *nama_tautan*, and *link_tautan*. The tbl_header table stores website header data with id_header and *foto*. The *visi_misi* table is designed to keep the school's vision and mission, consisting of *id_visi*, *visi*, *misi*, *sambutan*, and *sejarah*. YouTube videos are

stored in the tbl_youtube table, which contains id_youtube and kode. Moreover, the system manages various images through the *tbl_foto_eskul* table for extracurricular photos (*id_foto_eskul, foto, id_eskul*), the *tbl_foto_proli* table for study program images (*id_foto_proli, foto, id_proli*), and the *tbl_foto_upro* table for production unit photos *(id_foto_upro,* foto, *id_upro*).

This system is structured using an Entity-Relationship Diagram (ERD) to define relationships between different entities. There is a one-to-many relationship between tbl_user and tbl_guru, as a user can also be a teacher. Similarly, a one-to-many relationship exists between *tbl_guru* and *tbl_prodi*, where one teacher can be associated with a study program. The *tbl_prodi* table has a one-to-many relationship with *tbl_foto_proli*, as each study program can have multiple images. Likewise, *tbl_eskul* and *tbl_foto_eskul* share a one-to-many relationship since one extracurricular activity may have multiple photos. Lastly, a one-to-many relationship is established between *tbl_informasi* and tbl_user, as each piece of information references a user.

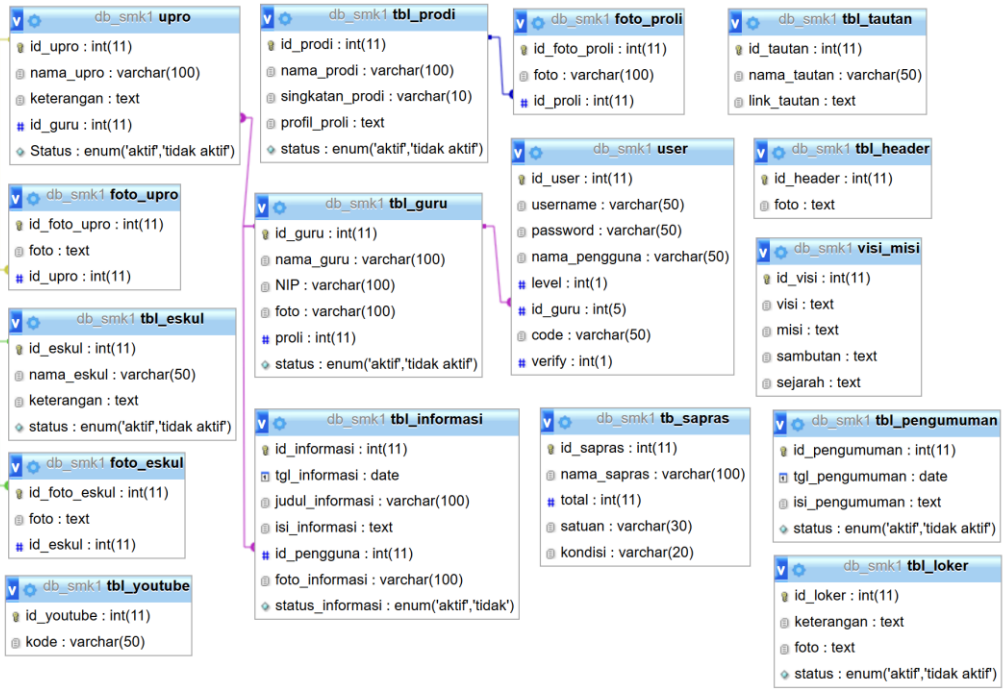


*Figure 2. Entity-Relationship Diagram*

b. System Access Flexibility
The developed web-based system provides excellent access flexibility, as it can be accessed anytime and anywhere through devices connected to the internet.

c. Continuous Maintenance and Development
System maintenance is carried out after implementation to ensure that the system operates smoothly. This process includes bug fixes, feature enhancements, and technical support to minimize potential disruptions.

d. Improving the Quality of Education Services
With the implementation of this system, SMK Negeri 1 Sorong has successfully improved efficiency in managing both academic and non-academic data. As a result, both students and teachers can easily access the necessary information without time constraints.

e. Challenges in Development and Implementation

However, during the development and implementation phases, several challenges arose, such as the need to improve user training and ensure a stable internet connection to support uninterrupted access. Additionally, user feedback and usability testing have not been extensively discussed, making it difficult to assess the system's effectiveness from the end-user perspective. Future work should include a more structured evaluation of user experience and satisfaction to enhance system usability. Analyzing data from Google Search Console Insights helps SMK Negeri 1 Sorong evaluate user interactions, system performance, and online presence by examining search queries, page views, and engagement, enabling data-driven improvements to enhance user experience and system functionality [20].

2. Interface Implementation

The following is the interface implementation of the Web-Based School Information System Design at SMK Negeri 1 Sorong, which has been developed by the researchers:

a. Admin User


*Figure 3. Login Page*

Figure 3 displays the login page. The login page is exclusively used by the admin to input and edit data that will be displayed on the public page.

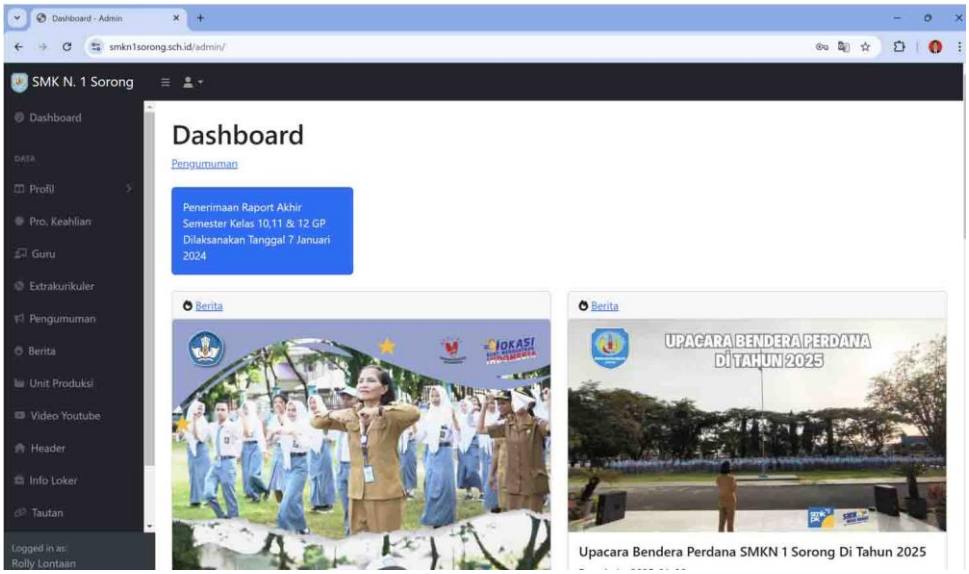


*Figure 4. Admin Dashboard Page*

Figure 4 shows the admin dashboard page, which serves as the initial page when the admin logs in. The dashboard contains announcements and news that have been published on the public page.

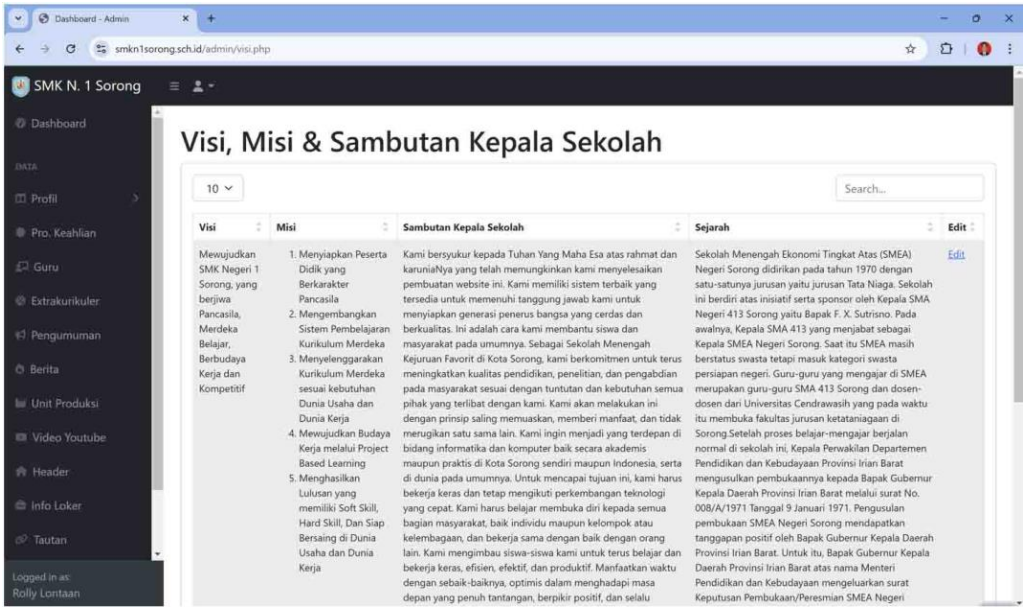


*Figure 5. School's Vision, Mission and Principal's Welcome Message settings page*

Figure 5 displays the settings page for the school's Vision, Mission, and Principal's Welcome Message.

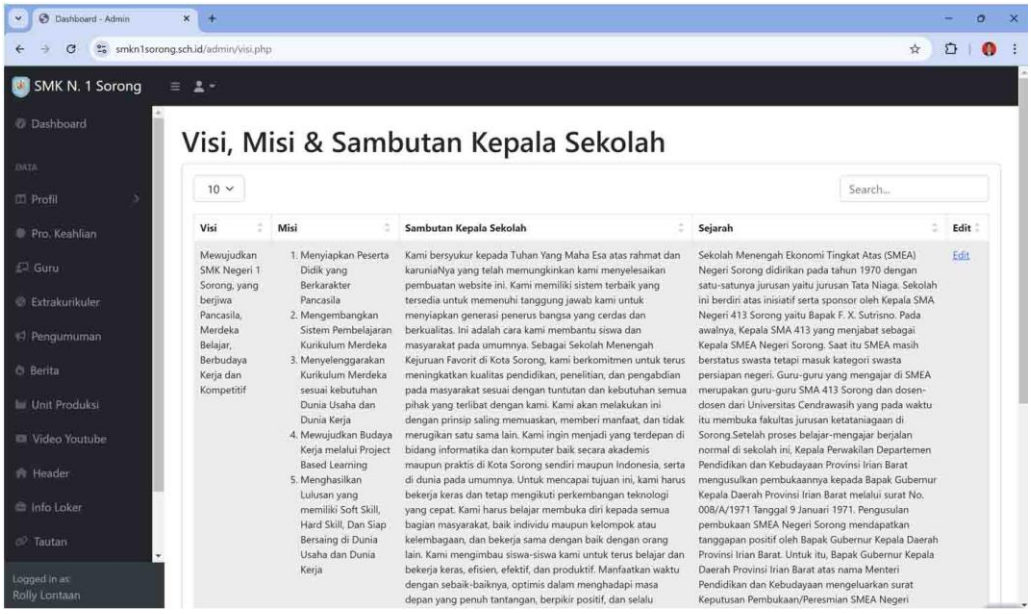


*Figure 6. Facilities and Infrastructure Data Settings Page*

Figure 6 displays the settings page for facilities and infrastructure data at SMK Negeri 1 Sorong.

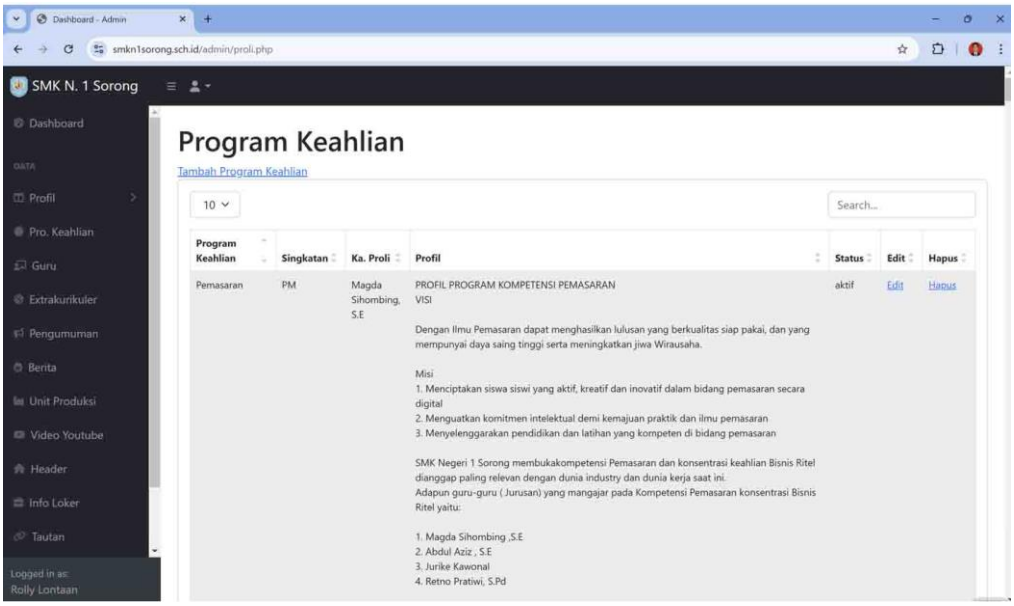


*Figure 7. Vocational Program Data Settings Page*

Figure 7 displays the settings page for vocational programs data, which includes adding new vocational programs, editing existing ones, and managing details such as the head of the program and the program profile.

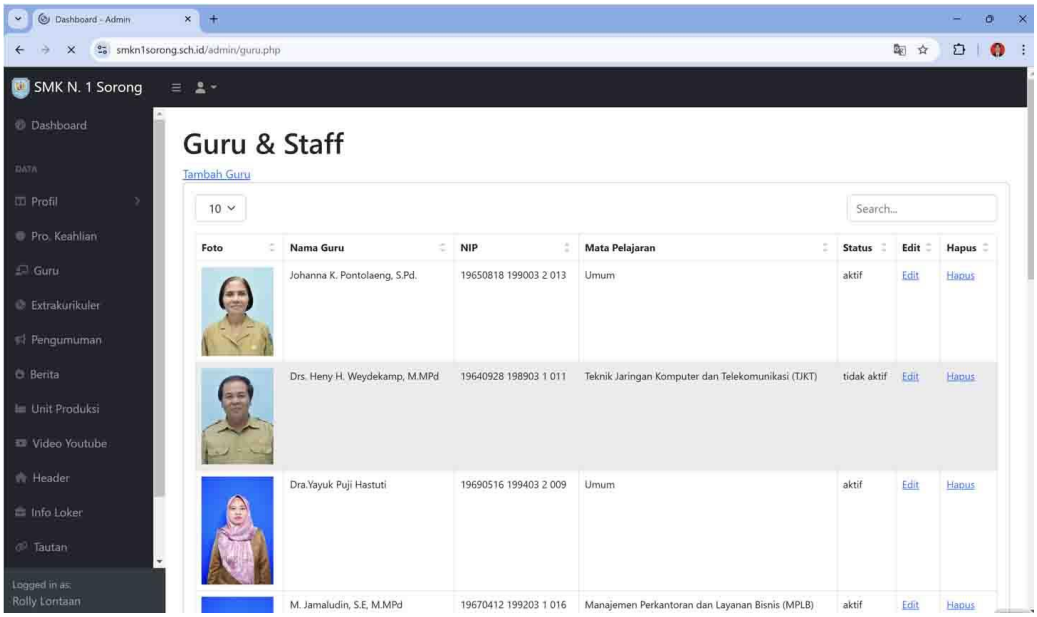


*Figure 8. Teacher Data Settings Page*

Figure 8 displays the teacher data settings page, which includes options to add a teacher, edit teacher data, and delete teacher data.

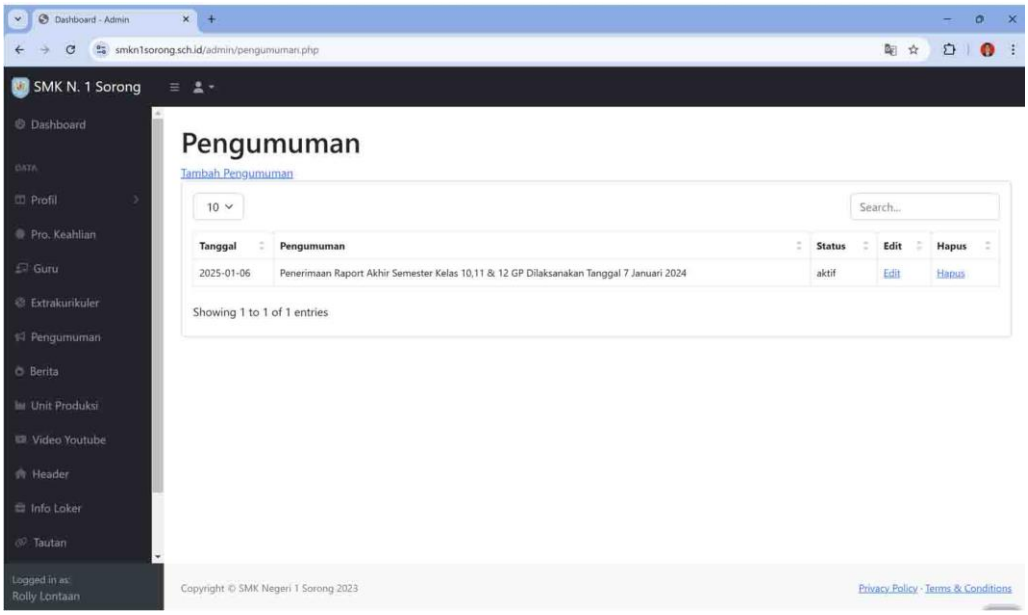


*Figure 9. Announcement settings page*

Figure 9 displays the announcement settings page, which includes options to add, edit, and delete announcements. This page has the same layout as the link settings page.

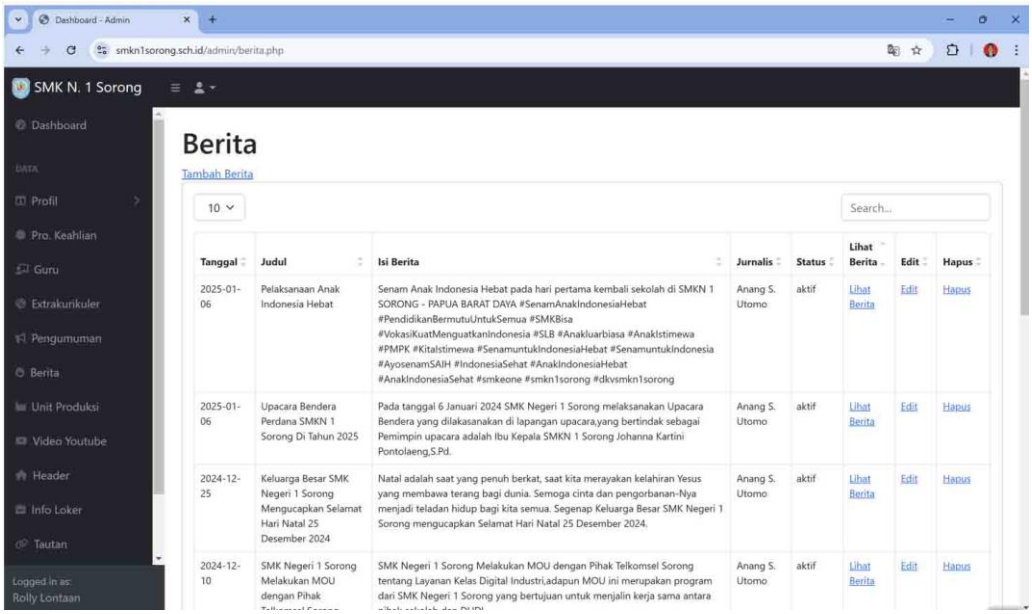


*Figure 10. News Settings Page*

Figure 10 displays the news settings page, which includes options to add news, edit news, delete news, and a link that can display the news. This page has the same layout as the job vacancy information settings page.

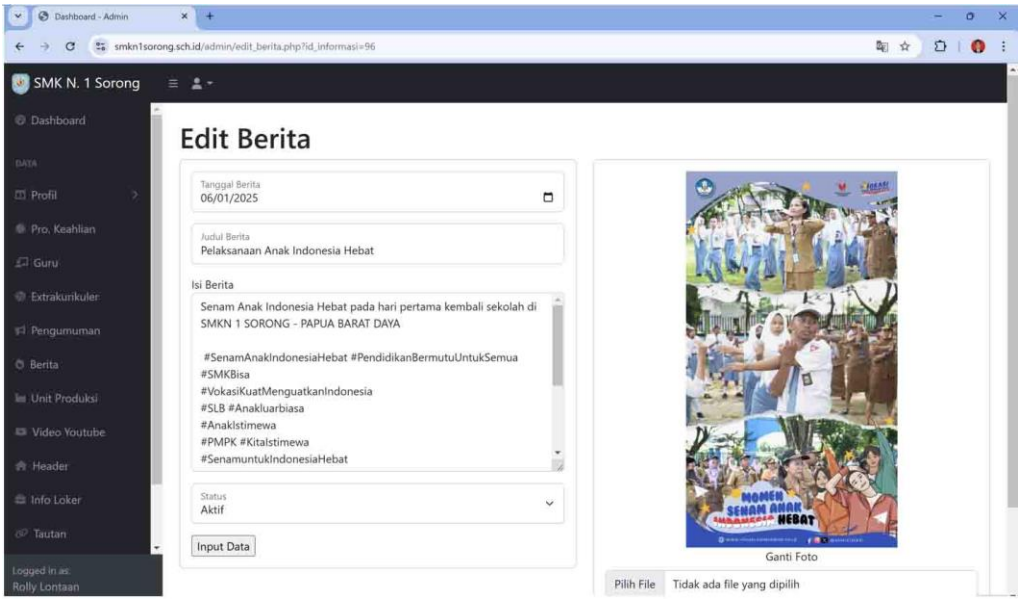


*Figure 11. Edit News Page*

Figure 11 displays the page for editing news data, which includes the news date, title, content, and status (whether the news is active or inactive), as well as the option to update the news photo. This page has the same layout as the job vacancy information settings page

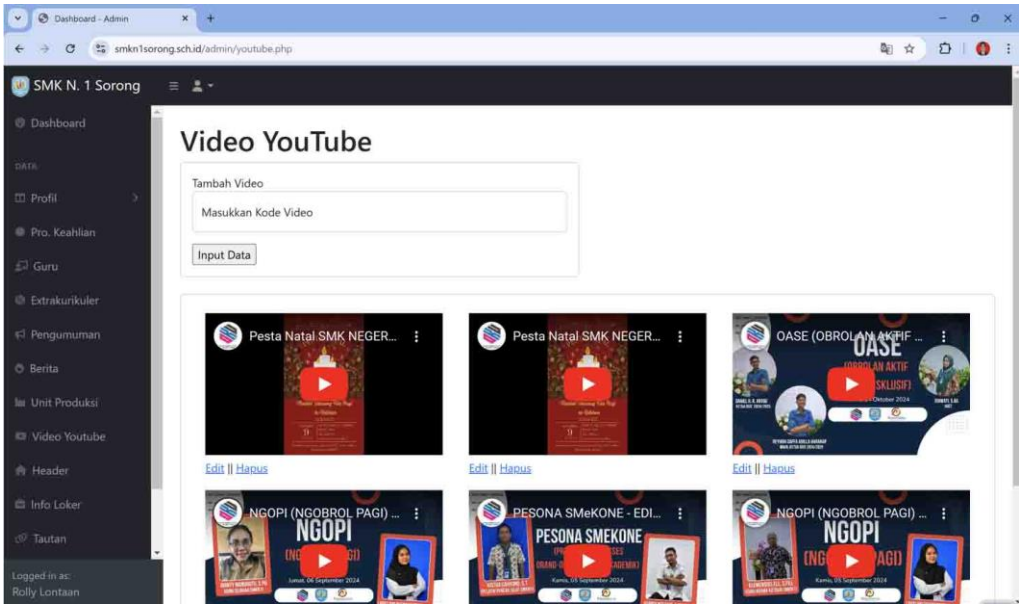


*Figure 12. YouTube Video Display Settings Page*

Figure 12 displays the settings page for managing YouTube videos of school activities, which includes options to add, edit, and delete YouTube videos.

b. Public User

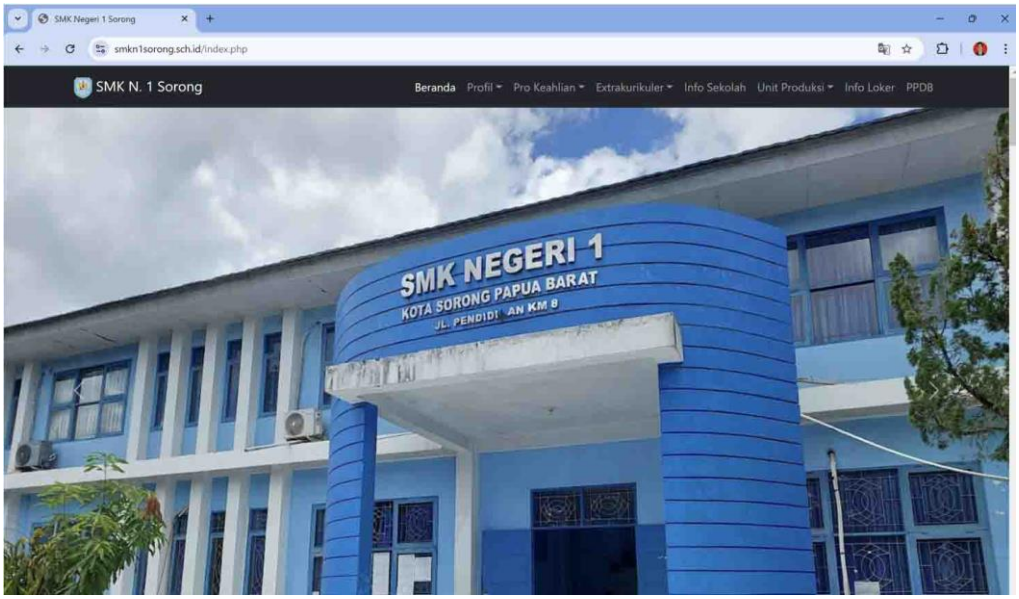


*Figure 13. Top of the Home page*

Figure 13 displays the top section of the homepage, where the images will rotate and display profile images of the vocational programs.

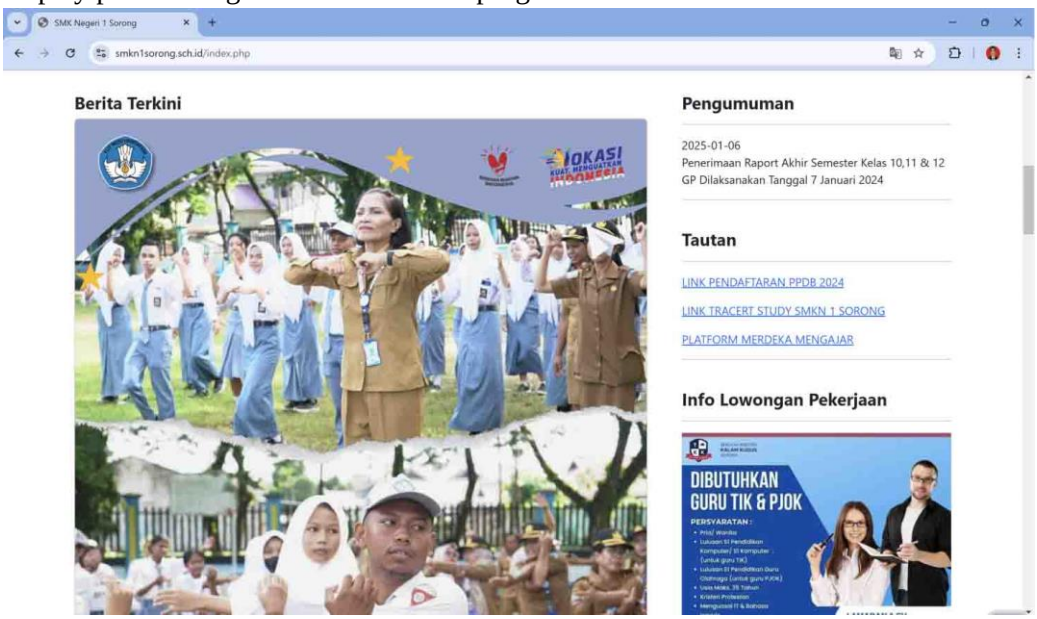


*Figure 14. Home page center section*

Figure 14 displays the middle section of the homepage, which includes the latest news, announcements, links, and job vacancy information.

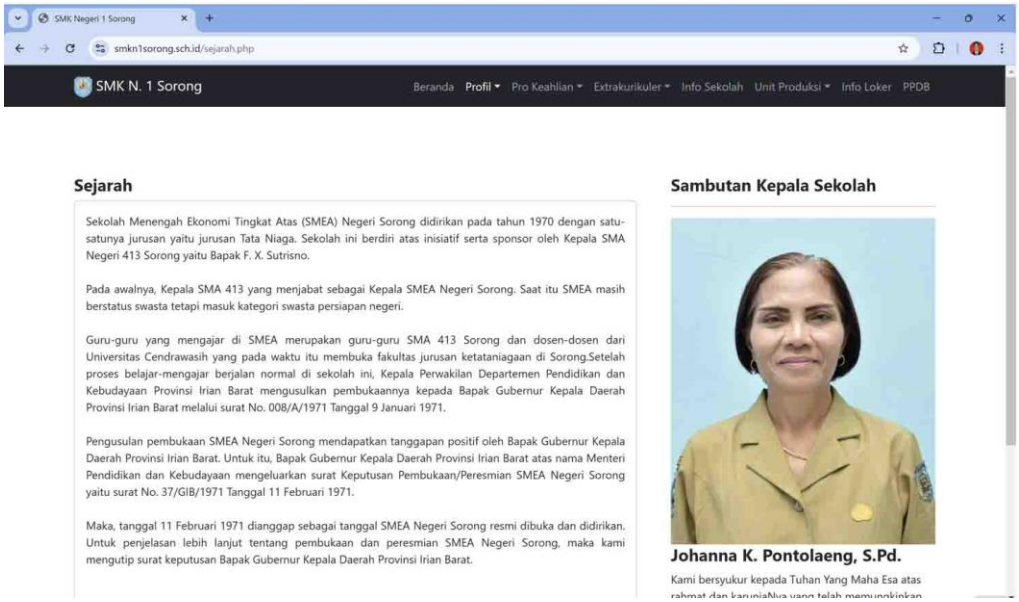


*Figure 15. School History Page*

Figure 15 displays the school history page, followed by a photo of the principal. This page has the same layout as the Vision and Mission page.

## 4. CONCLUSION

This research successfully designed and implemented a web-based information system for SMK Negeri 1 Sorong, aimed at improving the efficiency of managing academic and non-academic information. The system was developed using the Waterfall development model, with stages including needs analysis, design, implementation, testing, and maintenance. The results of the study show that the developed system, using PHP programming language and MySQL database, operates optimally on various devices with internet connections. This system provides easy access for students, teachers, and the community, and supports the digital transformation in the educational environment. Challenges in development included the need for user training and ensuring internet connection stability.

With the implementation of this system, SMK Negeri 1 Sorong can improve the quality of its educational services, make information delivery more efficient, and support the growing need for digitalization in modern education. Our findings show that the system helps streamline academic data management, speeds up communication between students and teachers, and reduces administrative errors.

However, there were some challenges during implementation, such as user adaptation to the new system and limitations in digital infrastructure. These challenges were addressed through user training and improvements in supporting facilities. Beyond benefiting SMK Negeri 1 Sorong, this system also has the potential to be adopted by other educational institutions with similar needs. Looking ahead, future research could explore adding more advanced features, such as AI integration or data-driven learning systems. These improvements could make the system even more effective and adaptable to the evolving landscape of digital education.

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