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Web-Based School Information System: Design and Implementation of the SMPN 2 Mandirancan Digital Portal

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ABSTRACT

The digital transformation of educational institutions has increased the need for integrated and interactive school information systems. However, many secondary schools still rely on conventional information services and static websites, limiting access to information and user interaction. This study aims to develop and evaluate a web-based digital school portal integrated with an interactive chatbot at SMPN 2 Mandirancan, Indonesia. The study was conducted at a single junior secondary school, using a Research and Development approach with the Prototype model to support interactive system development informed by user feedback. The digital portal was developed using the WordPress Content Management System (CMS) and enhanced with supporting plugins to provide dynamic content management and automated information services. The developed system was evaluated using a user acceptance questionnaire with 30 respondents: 8 teachers, 2 administrative staff members, 15 students, and 5 parents. The collected data were analyzed using descriptive statistics, with the mean score calculated for each evaluation indicator. The results showed that all evaluation indicators achieved mean scores above 4.00, including usability (4.53), information quality (4.40), service efficiency (4.43), user satisfaction (4.60), and chatbot effectiveness (4.47), indicating that the developed system was feasible and well accepted by users. The findings demonstrate the feasibility and positive user acceptance of integrating the WordPress CMS and chatbot technology into a digital school portal to support interactive school information services. This study presents a practical, low-cost framework for integrating the WordPress CMS and chatbot technology into a digital school portal that provides interactive information services in resource-constrained secondary schools.

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1. INTRODUCTION

The rapid development of information and communication technology has accelerated digital transformation in various sectors, including education. Digital technology is no longer limited to supporting teaching and learning activities but has also become an important component in improving institutional communication, information accessibility, and educational service delivery. Educational institutions are increasingly required to provide information services that are accurate, accessible, and responsive to support the needs of students, parents, teachers, and other stakeholders. The use of digital media offers educational institutions opportunities to improve the effectiveness of information dissemination compared with conventional communication approaches [1].

Traditionally, schools have relied on conventional media such as printed announcements, bulletin boards, and direct communication to distribute institutional information. Although these approaches remain useful, they have limitations in terms of accessibility, updating processes, and information distribution speed. Stakeholders often need to be physically present at schools to obtain updated information, which can delay announcements on academic activities, school programs, admission procedures, and administrative services. Digital media offers an alternative approach because information can be accessed online without being constrained by time or location, thereby improving communication efficiency between institutions and stakeholders [1].

One of the most widely adopted digital solutions in educational institutions is the use of school websites to disseminate institutional information. Previous studies consistently indicate that school websites improve information accessibility, institutional visibility, and communication with stakeholders. CMS-based platforms, particularly WordPress, have been widely utilized because they enable educational institutions to manage website content efficiently without requiring advanced programming skills [2]. Collectively, these studies demonstrate that CMS technology has become an effective solution for supporting digital communication in schools. However, the primary focus of previous implementations has been on publishing institutional information rather than providing interactive services that facilitate real-time communication with users [3].

Although digital platforms are increasingly used in educational environments, different types of systems have different scopes and functions. A school website primarily functions as a public information medium for publishing school profiles, announcements, and general information. A digital school portal extends this function by integrating interactive services that facilitate more efficient access to information. In contrast, a school information system generally refers to a broader system that manages structured institutional data, including student records, attendance, academic information, and administrative transactions. A Learning Management System (LMS) focuses specifically on supporting learning processes through digital classrooms, learning materials, assignments, and assessments. Meanwhile, an administrative information system focuses on supporting institutional administrative activities and documentation.

Based on these distinctions, the system developed in this study is categorized as a digital school portal rather than a comprehensive school information system. The proposed

system focuses on providing public school information services and chatbot-assisted information retrieval. It does not aim to manage academic databases, student records, attendance, or administrative transactions. This classification clarifies the research scope and ensures that the study's contribution is appropriately positioned within educational information technology.

Previous research has consistently demonstrated that Content Management Systems (CMS) provide educational institutions with flexible and efficient tools for developing digital information platforms [4]. Among various CMS platforms, WordPress has gained widespread adoption because of its open-source architecture, extensibility, and ease of use [5], [6]. Existing studies generally agree that WordPress simplifies website development and enables schools to manage digital content independently with minimal technical expertise. Nevertheless, most CMS-based implementations remain oriented toward information publishing and content administration rather than supporting interactive communication between institutions and stakeholders [7].

However, many existing school websites still emphasize one-way information delivery. Users are generally required to navigate efficiently when immediate responses are needed. Website development trends indicate that modern websites increasingly require interactive features to improve usability and user experience [8]. Furthermore, continuous management and improvement are necessary to ensure that websites function effectively as sustainable digital information portals [5], [9].

Previous research has consistently demonstrated that Content Management Systems (CMS) provide educational institutions with flexible and efficient tools for developing digital information platforms. Among various CMS platforms, WordPress has gained widespread adoption because of its open-source architecture, extensibility, and ease of use [10]. Existing studies generally agree that WordPress simplifies website development and enables schools to manage digital content independently with minimal technical expertise. Nevertheless, most CMS-based implementations remain oriented toward information publishing and content administration rather than supporting interactive communication between institutions and stakeholders [11], [12], [13].

Existing literature has explored digital information services in educational institutions from several perspectives. First, studies on web-based school information systems primarily focus on improving institutional data management, administrative efficiency, and information accessibility. Second, research on Content Management Systems demonstrates that platforms such as WordPress simplify website development and enable schools to manage digital content independently. Third, chatbot studies have shown that conversational technologies improve information retrieval efficiency by providing automated responses to user inquiries. Although these research streams collectively contribute to digital transformation in education, they remain largely fragmented. Most studies investigate school information systems, CMS-based websites, or chatbot applications independently, with limited attention given to integrating these technologies into a unified digital school portal capable of delivering interactive public information services [12], [13].

Research on Content Management Systems has also shown that CMS-based platforms offer advantages in flexibility, usability, and independent content management.

CMS enables institutions to create, organize, and update digital content without requiring extensive programming expertise [14]. WordPress has been widely adopted in educational environments due to its simplicity, extensibility, and support for rapid website development [15], [16], [17]. Nevertheless, CMS-based school websites generally remain focused on content publication and have limited capabilities for direct user interaction.

Similarly, chatbot research in education has indicated that conversational systems can improve information service efficiency by providing automated responses to frequently requested information. Previous studies have implemented chatbot systems through various platforms, including WhatsApp-based assistants and web-based chatbot frameworks, demonstrating their potential to support student and institutional information services [18], [19], [20], [21]. However, chatbot studies commonly evaluate chatbot functionality as an independent service rather than integrating chatbot technology into a comprehensive digital school portal.

The need to improve digital information services was identified at SMPN 2 Mandirancan through interviews with several school stakeholders, including the principal, vice principal, teachers, an information and Communication technology (ICT) teacher, and administrative staff. The results indicated that school information dissemination was still primarily conducted via WhatsApp, a simple website, direct inquiries, and conventional announcements. The existing website primarily provided basic institutional information and did not yet support interactive information retrieval features.

Based on the interview findings, several types of information were frequently requested by students and parents, including school activity updates. Teachers and administrative staff also reported that similar questions were repeatedly submitted via existing communication channels, requiring additional time to respond. These conditions indicate the need for an information service platform that can provide faster access to school information while reducing repetitive communication tasks for school personnel.

Previous studies have investigated various approaches to developing digital services in educational environments. CMS-based school websites have been widely developed to support information publication, institutional profiles, and promotional activities [17], [22], [23]. Other studies have focused on developing web-based school information systems to improve institutional information management [12], [13]. Meanwhile, chatbot-based studies have explored automated information services using platforms such as WhatsApp, web frameworks, and messaging applications [18], [19], [20], [21].

Although previous studies have substantially contributed to the digital transformation of educational information services, several important gaps remain. Existing CMS-based school websites primarily support one-way information dissemination, whereas school information systems mainly emphasize administrative data management. Likewise, chatbot studies generally evaluate conversational agents as standalone applications without integrating them into institutional digital portals. Consequently, empirical evidence regarding the development of affordable, integrated, and interactive digital school portals for public secondary schools remains limited.

Therefore, the research gap addressed in this study is the limited development of an affordable, interactive digital school portal that integrates content management capabilities

with chatbot-based information retrieval for public secondary schools. The novelty of this research does not rely solely on the combination of WordPress and chatbot technology but lies in the design of a practical digital information service model developed to meet the needs of multiple school stakeholders. The proposed approach emphasizes low-cost implementation, ease of content management, and improved accessibility of school information.

Based on the identified problem and research gap, this study aims to design and implement a chatbot-assisted digital school portal for SMPN 2 Mandirancan using WordPress CMS. Specifically, this study aims to (1) develop a digital portal that improves access to school information, (2) integrate chatbot functionality to support automated information retrieval, and (3) evaluate the effectiveness of the developed system in supporting school information services.

The contribution of this study is expected to provide a practical reference for educational institutions, particularly public schools with limited technological resources, in implementing affordable digital transformation solutions. Furthermore, this research provides empirical evidence on the development and evaluation of an interactive school information service platform that combines CMS-based website management with chatbot technology.

2. METHOD

This study employed a design-and-development research approach, using an iterative software prototyping model. This approach was selected because the research was not limited to developing a software product but also involved systematic investigation, identification of user requirements, prototype development, evaluation, and refinement based on empirical data obtained from stakeholders. Design and development research is an approach used to produce and evaluate technological products through systematic procedures that involve analysis, design, development, implementation, and evaluation [24].

The prototyping model was selected because it supports an iterative development process through continuous interaction between researchers and users. This model allows researchers to develop an initial prototype, gather user feedback, and refine the system based on evaluation results until the product meets user requirements [25]. Furthermore, iterative development enables gradual refinement of system specifications and improves the alignment between system functionality and stakeholder expectations [26].

This research was conducted at SMPN 2 Mandirancan, Indonesia. The research activities included requirement analysis, system design, prototype development, system testing, user evaluation, refinement, and the final implementation of a chatbot-assisted digital school portal.

The participants were selected using a purposive sampling technique because the research required individuals with direct involvement and knowledge of school information management and communication processes. The requirement analysis stage involved five stakeholder categories: the principal, vice principal, teachers, an information and Communication technology teacher, and administrative staff. These participants were

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selected because they were directly involved in managing, providing, and utilizing school information services.

The system evaluation stage involved 30 respondents, including teachers, administrative staff, students, and parents. The involvement of multiple stakeholder groups aimed to elicit diverse perspectives on system usability, information accessibility, service efficiency, and chatbot effectiveness.

This study utilized both primary and secondary data sources. Primary data were obtained directly from research participants through observation, semi-structured interviews, and user evaluation questionnaires. Secondary data were obtained from school documents related to information services, including school profile documents, student admission information, academic schedules, and school activity documentation.

Data collection was conducted through observation, interviews, documentation studies, and questionnaires. Observation activities focused on identifying existing information dissemination mechanisms, the communication channels used by the school, the utilization of existing websites, and the information most frequently requested by students and parents. The observation results were used to identify limitations of current information services and determine system improvement requirements.

Semi-structured interviews were conducted with the principal, vice-principal, teachers, the information technology subject teacher, and administrative staff. The interview process aimed to identify current information management practices, frequently requested information, limitations of existing communication media, challenges experienced by school personnel, and expected features of the proposed digital portal.

The interview guide consisted of the following questions:

Table 1. Interview Guide

No	Interview Questions
1	How is school information currently distributed to students, parents, and teachers?
2	What types of school information are most frequently requested by students and parents?
3	What limitations are experienced when using current communication media such as WhatsApp, direct communication, or existing websites?
4	What features are required in a digital school portal to improve information accessibility?
5	How can chatbot technology support the process of obtaining school information?

A documentation analysis was conducted to identify information to be integrated into the digital school portal. The analyzed documents included school profiles, admission procedures, academic schedules, and school activity information. These documents were selected based on their relevance to stakeholder information needs.

The results obtained from observations, interviews, and documentation analysis were transformed into functional and non-functional system requirements. The requirement analysis stage ensured that the developed system was based on actual stakeholder needs rather than only technical assumptions [27].

Table 2. Functional and Non-Functional Requirements

Category	Requirement
Functional Requirements	School profile information management School announcement publication Academic schedule information display Digital book access School activity documentation Contact information service Chatbot-based information retrieval
Non-Functional Requirements	User-friendly interface Mobile responsiveness Fast response time System availability Data security Maintainability Accessibility

The system development followed the stages of the prototyping model. The first stage was requirements analysis, in which empirical findings from observations, interviews, and documentation studies were translated into system specifications [27].

The second stage involved rapid design, including system architecture, interface layout, workflow design, and database organization. System design functions as a process of translating user requirements into a technical system model [28].

The proposed system architecture consisted of three main components:

1. Users consisting of students, teachers, and parents;
2. WordPress CMS-based digital school portal;
3. Chatbot service

Users accessed the portal via web browsers, while the chatbot provided an alternative way to retrieve school information without requiring users to manually navigate multiple website menus.

The third stage involved prototype development using the WordPress Content Management System (CMS) supported by themes and plugins. The developed prototype included school profile information, announcements, academic schedules, access to digital books, and chatbot-based information services. Prototype development allows users to evaluate system concepts through an operational representation before final implementation [29].

The fourth stage involved prototype evaluation. Users interacted with the developed system and provided feedback regarding interface usability, information accessibility, feature suitability, and chatbot performance. User evaluation was conducted to ensure that the developed system fulfilled actual stakeholder requirements [27].

The fifth stage involved prototype refinement and implementation. The prototype was improved based on user evaluation results through an iterative process until the system achieved the expected functionality and usability level [30]. The final system was implemented on WordPress hosting infrastructure, and maintenance activities included

content updates, security management, and system improvements to ensure long-term usability [31].

The overall research procedure adopted in this study is illustrated in Figure 1. The flowchart summarizes the iterative stages of the prototype development process, from requirement analysis to system implementation and maintenance. The iterative evaluation process enables continuous refinement of the prototype based on user feedback until the system satisfies the predefined feasibility criteria.

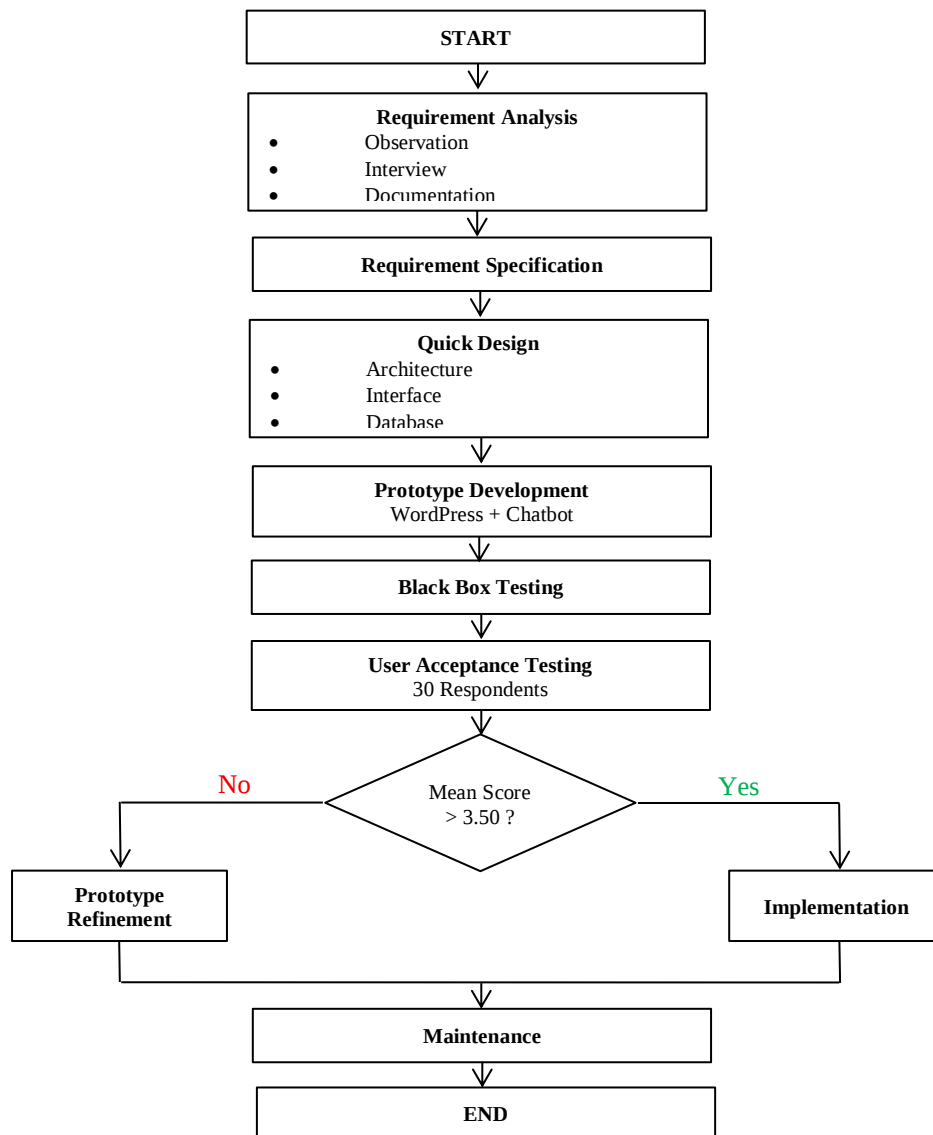


Figure 1. Research Flow Using the Prototype Development Model

System evaluation was conducted through functional testing and User Acceptance Testing (UAT). Functional testing was performed using the black-box testing method to verify whether the system functions operated according to predefined requirements. Black-box testing evaluates system output based on input conditions without examining the internal program structure [32].

User Acceptance Testing was conducted with 30 respondents, including teachers, administrative staff, students, and parents. The evaluation instrument used a five-point Likert Scale consisting of usability, information quality, and service efficiency to determine whether the developed system was acceptable and suitable from the perspective of end users [33].

The quantitative evaluation data obtained from questionnaires were analyzed using descriptive statistics, with the mean score for each evaluation indicator calculated. The system was considered feasible when the average score reached a minimum value of 3.5.

Meanwhile, qualitative data from interviews and observations were analyzed using thematic analysis across several stages, including data organization, data reduction, identification of key statements, categorization, and interpretation of findings.

To ensure data credibility, this study applied source triangulation by comparing information obtained from different stakeholder groups, including school leaders, teachers, administrative staff, students, and parents. Ethical principles were applied throughout the research process. Participants were informed about the research objective and procedures before data collection. Participation was voluntary, and all collected information was kept confidential by protecting participants' identities through the use of codes rather than real names.

3. RESULTS AND DISCUSSION

3.1 Results

3.1.1. Requirement Analysis

The initial stage of this study involved identifying system requirements through observation, semi-structured interviews, and document analysis conducted at SMPN 2 Mandirancan. The requirement analysis was performed to understand the existing information management process and identify problems experienced by school stakeholders before developing the digital school portal.

The data collection involved five categories of stakeholders: the principal, vice principal, teachers, an Information and Communication Technology (ICT) teacher, and administrative staff. The observations focused on the existing school information dissemination process, including announcement distribution, academic information delivery, administrative services, and user interaction through available communication channels. The interviews were conducted to identify user expectations, frequently requested information, and required digital services. Meanwhile, document analysis was performed by reviewing existing school information material, including announcements, academic schedules, and institutional documents.

The analysis results indicated that school information was mainly distributed through WhatsApp groups, direct communication, notice boards, and a simple institutional website. Although these methods supported basic information dissemination, several limitations were identified, including difficulties accessing updated information, repetitive inquiries from students and parents, and reliance on school personnel for information.

These requirements formed the basis for the development of the functional and non-functional system requirements presented in Tables 1 and 2.

Table 1. Functional Requirements of the Proposed Digital School Portal

No	Functional Requirement
1	School profile management
2	News and announcement publication
3	Academic schedule display
4	Digital book access
5	Contact information service
6	Chatbot-based information retrieval

Table 2. Non-Functional Requirements of the Digital School Portal

No	Non-Functional Requirement
1	Usability
2	Mobile responsiveness
3	Security
4	Maintainability
5	System availability
6	Accessibility
7	Acceptable response time

3.1.2. Development of the Digital School Portal

Based on the identified requirements, a digital school portal was developed using the WordPress Content Management System (CMS). The development process adopted an iterative software prototyping model, enabling continuous improvement through stakeholder feedback-driven evaluation and refinement.

The developed system consists of three main components:

1. Users consisting of students, teachers, parents, and administrative staff;
2. WordPress CMS-based portal as the main information management platform;
3. Chatbot service as an interactive information retrieval interface.

The portal can be accessed through desktop computers and smartphones using standard web browsers. The system structure was designed with consideration of usability principles to ensure that users with different levels of digital literacy could navigate the available services.

The developed portal contains several main menus as presented in Table 3.

Table 3. Main Menu Structure of the Digital School Portal

No.	Main Menu	Submenu
1.	Homepage	Main Page
2.	Profile	Vision, Mission, History
3.	Information	Announcements, News
4.	Academics	Class Schedules
5.	Digital Library	E-Books
6.	Contact	Contact Form
7.	Chatbot	Interactive Information Services

The chatbot was developed to assist users in retrieving school information without requiring extensive navigation through multiple webpages. The chatbot provides responses

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based on available school information related to admission procedures, academic schedules, and institutional services.

3.1.3. Functional Testing

After the prototype development stage, functional testing was conducted using the black-box testing method. The testing process evaluated whether each developed feature operated according to the predetermined functional requirements.

Table 4. Functional Testing Results

No.	System Feature	Results
1.	Authentication	Passed
2.	Content Management	Passed
3.	Website Navigation	Passed
4.	Digital Library Module	Passed
5.	Chatbot Service	Passed

The results showed that all tested features operated according to their expected functions without critical errors.

3.1.4. User Acceptance Testing

User Acceptance Testing (UAT) was conducted after functional testing to evaluate user perceptions of the developed portal. The evaluation involved 30 respondents, including teachers, administrative staff, students, and parents.

Table 5. Respondent Distribution

Category	N
Teachers	8
Administrative Staff	2
Students	15
Parents	5
Total	30

The evaluation questionnaire used a five-point Likert scale with indicators for usability, information quality, service efficiency, user satisfaction, and chatbot effectiveness.

Table 6. User Acceptance Evaluation Results

Indicator	Mean	Category
Usability	4.53	Excellent
Information Quality	4.40	Good
Service Efficiency	4.43	Good
User Satisfaction	4.60	Excellent
Chatbot Effectiveness	4.47	Good

User satisfaction had the highest mean score (4.60), while information quality had the lowest (4.40). Nevertheless, all evaluation indicators exceeded the predefined feasibility threshold (3.50), indicating positive user acceptance of the developed digital school portal.

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3.2. Discussion

3.2.1. Interpretation of Main Findings

The findings demonstrate that users positively evaluated the developed digital school portal as an information service medium. The high usability score (4.53) indicates that the interface was easy to understand and accessible to users with varying levels of digital experience.

The highest score was obtained for user satisfaction (4.60). This result suggests that the portal successfully addressed several stakeholder expectations, particularly by providing easier access to school information, structured information presentation, and additional interactive services.

Meanwhile, information quality received the lowest score (4.40), although it remained within the good category. This finding may be related to the evaluation being conducted during the initial implementation stage, when the available content was limited to existing institutional information. Continuous updating and content management are required to maintain information accuracy and completeness.

3.2.2. Comparison with Previous Studies

The findings support previous studies that reported WordPress CMS as an effective platform for developing educational information websites because it enables rapid development, flexible content management, and relatively low implementation costs [9], [22], [23].

Previous research mainly focused on developing a school website as an information publication medium. In contrast, this study extends previous work by integrating chatbot functionality into a WordPress-based digital school portal to provide an interactive information retrieval mechanism.

The chatbot implementation is consistent with previous studies regarding the utilization of virtual assistants in educational information services [18], [25], [26], [27]. However, this study differs by combining CMS-based information management and chatbot services into a single platform designed for a public junior high school environment.

3.2.3. Fulfillment of Stakeholder Requirements

The developed portal successfully incorporated several requirements identified during the requirement analysis stage. Information publication, academic schedules, digital books, contact services, and chatbot-based information retrieval were implemented based on stakeholder needs.

The involvement of the principal, teachers, ICT teacher, and administrative staff during requirement identification ensured that the developed system reflected the actual school information service requirements.

3.2.4. Sustainability and Maintenance Considerations

Although the developed portal received initial positive acceptance, long-term sustainability requires ongoing management. Administrative staff are responsible for updating school information, announcements, and institutional documents. Meanwhile, ICT

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teachers provide technical support for WordPress configuration, plugin updates, database backups, and security monitoring.

Regular training is recommended to maintain system continuity, especially when staff members responsible for system management change. Content Validation procedures are also required to ensure that published information remains accurate and relevant.

3.2.5. Accessibility and Technical Challenges

The portal was developed with a responsive design to support access on smartphones, given that many users primarily rely on mobile devices. Nevertheless, future improvements should consider broader accessibility requirements, including simplified navigation, readable interface design, alternative text for visual content, and optimization for users with limited internet bandwidth.

Using WordPress plugins also introduces several technical considerations. Plugin compatibility issues, security vulnerabilities, discontinued plugin support, and dependency on third-party developers represent potential challenges. Therefore, periodic maintenance and security updates are necessary to ensure reliable system operation.

3.2.6. Limitations and Future Research

This study provides preliminary evidence regarding the design and user acceptance of the chatbot-assisted digital school portal implemented in one public junior high school. Therefore, the findings should not be interpreted as evidence of general effectiveness across all educational institutions.

Another limitation is that the evaluation focused on immediate user acceptance after system development. This study did not measure long-term usage patterns, continuous content updates, reduction of administrative workload, or changes in communication effectiveness over extended periods.

Future research should involve multiple schools, longitudinal evaluation, and larger respondent groups. Further development may also integrate more advanced chatbot technologies based on artificial intelligence and natural language processing to improve conversational capability and information accuracy.

4. CONCLUSION

The primary objective of this study was to develop and conduct an initial evaluation of a web-based school digital portal using the WordPress Content Management System (CMS) integrated with a chatbot service to support the delivery of digital information at SMPN 2 Mandirancan. The study focused on designing, implementing, and assessing the feasibility and user acceptance of the developed system.

The findings indicate that the proposed portal was successfully developed and that its main functional features operated as intended during system testing. Based on the initial user evaluation, the developed system received positive ratings for feasibility and acceptance from participating users across all evaluated questionnaire dimensions. Participants also perceived the chatbot as a useful interactive feature for retrieving commonly requested school information through the digital portal. These findings indicate that the developed

portal is feasible for implementation as a school information portal within the context of the participating school. However, the present study does not provide evidence of improved information service performance, reduced administrative workload, or faster information retrieval compared with previous systems, long-term user adoption, or institutional scalability, as these aspects were beyond the scope of the current evaluation.

From a theoretical perspective, this study contributes to the growing body of knowledge on the implementation of low-code Content Management System (CMS)-based digital platforms in educational settings. It also provides empirical evidence regarding the initial feasibility and user acceptance of integrating a chatbot into a school information portal using widely available open-source technologies. These findings extend previous studies on school digitalization by demonstrating the practical implementation of an integrated WordPress-based portal and an interactive chatbot in a real educational environment.

From a practical perspective, the developed portal provides educational institutions with an integrated platform for delivering school information via a centralized web interface, with an interactive chatbot. The implementation demonstrates how open-source technologies can be used to develop affordable, accessible digital information systems, particularly for schools with limited technical expertise and financial resources.

Several limitations should be acknowledged. First, this study was conducted in a single school, limiting the generalizability of the findings. Second, the evaluation involved a relatively small purposively selected sample, which may not fully represent broader user populations. Third, the evaluation instrument was developed specifically for this study and was not based on a standardized or previously validated usability scale. In addition, several evaluation constructs were measured using a limited number of questionnaire items. The study also did not include comparisons with the previous information system, objective usability metrics (e.g., task completion time, error rates, and response accuracy), long-term usage analytics, accessibility evaluation, or security testing. Furthermore, the chatbot relied on predefined responses rather than on adaptive artificial intelligence.

Future research should employ validated usability instruments, such as the System Usability Scale (SUS) or User Experience Questionnaire (UEQ), to strengthen the reliability and comparability of evaluation results. Subsequent studies are encouraged to incorporate objective usability metrics and to conduct pre- and post-implementation comparisons. With existing school information systems, collect server and user analytics, evaluate accessibility and security, involve multiple schools with more diverse participant populations, and conduct longitudinal evaluations to examine long-term adoption and sustainability. Future work may also investigate integrating AI-assisted chatbots while carefully evaluating their response accuracy, reliability, and suitability for educational information services.

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