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Implementing a Web-Based Alumni Information System to Strengthen Data Governance in Secondary Education

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Abstract

The growing demand for transparent, accurate, and participatory data governance in secondary education has exposed limitations in conventional alumni data management practices in many senior high schools, particularly those that rely on manual records or fragmented digital files. This article reports on the design and implementation of a web-based alumni data management information system developed as a community service-based applied study to support institutional efficiency and alumni engagement. The system development process was informed by a needs assessment involving school administrators and alumni, with data collected through direct observation, semi-structured interviews, and questionnaires. System functionality was evaluated using Black Box Testing to verify compliance with predefined operational requirements. The implementation involved a single senior high school as the institutional partner, with administrative users and alumni as the primary system users. Functional testing results confirmed that all core modules, authentication, alumni data management, information dissemination, and data reporting, operated as intended without critical errors. The system enabled real-time data updating and reduced administrative dependency on physical presence, indicating improved operational efficiency and data accessibility. From a broader perspective, this study contributed a replicable community-oriented model for implementing alumni information systems in secondary education, demonstrating how web-based platforms can strengthen institutional alumni interactions and support digital transformation agendas across diverse educational contexts.

Keywords: Web-Based Information System; Alumni Data Governance; Community-Based Implementation; Secondary Education; Digital Transformation.

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Introduction

The rapid advancement of information and communication technologies has reshaped data governance practices across public and private sectors, including education. Educational institutions increasingly depend on digital information systems to enhance administrative efficiency, transparency, and accountability in response to growing stakeholder expectations and regulatory demands (Lokollo & Rumfod, 2024; Mumin, 2019; Mustari, 2023). Empirical evidence indicates that technology-supported data management systems outperform manual or semi-digital approaches in terms of accuracy, accessibility, and decision-making reliability (Saputri & Zulkarnain, 2024; Deha, 2024). Within this broader digital transformation, secondary education institutions face mounting pressure to modernize their information infrastructures to ensure sustainable institutional management and stakeholder engagement (Nasution et al., 2024).

Among institutional data assets, alumni information holds strategic significance. Alumni outcomes are widely recognized as indicators of educational quality, institutional relevance, and social impact, while alumni networks contribute to reputation building, stakeholder trust, and opportunities for collaboration with external partners (Sandi et al., 2025; Wulandari, 2025). Prior studies have shown that active alumni engagement can strengthen institutional sustainability through academic collaboration, mentoring initiatives, and non-academic contributions such as fundraising and community outreach (Subekti & Astuti, 2019). Consequently, alumni data management extends beyond administrative record-keeping and functions as a strategic instrument for institutional development.

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Recent research emphasizes that structured alumni information systems facilitate communication, support professional network formation, and enable institutions to leverage alumni resources for partnerships with industry, higher education institutions, and scholarship providers (Rifai et al., 2017; Sidik et al., 2022; Dheri et al., 2025). In particular, web-based platforms offer advantages in real-time data updating, cross-platform accessibility, and long-term data integrity, making them suitable for institutional data governance in diverse educational contexts (Rahardja et al., 2016; Trihanggara & Erzed, 2024). These platforms align with contemporary digital governance frameworks that conceptualize information systems as socio-technical infrastructures supporting institutional coordination rather than isolated technical tools.

Despite these documented benefits, empirical observations indicate that many senior high schools continue to manage alumni data using conventional approaches, such as manual documentation or basic spreadsheet applications (Ramadhan, 2025). Such practices often result in fragmented datasets, limited accessibility, data redundancy, and increased vulnerability to data loss or obsolescence (Chairul et al., 2023). While previous studies have proposed alumni information systems at the tertiary education level or within mobile application environments (Awaludin et al., 2019; Saputra et al., 2022), systematic investigations focusing on web-based alumni data management as a community service–oriented intervention in secondary education remain limited. Existing literature tends to prioritize technical system functionality while paying insufficient attention to institutional needs assessment, stakeholder participation, and practical implementation outcomes within school communities.

This gap underscores the need for applied research that integrates system development with a community service orientation, emphasizing partner engagement, contextual relevance, and institutional impact. Addressing this need, the present study implemented and evaluated a web-based alumni data management information system tailored to the operational conditions of a senior high school. Unlike prior studies that primarily emphasize technical development, this research situates system implementation within a participatory framework, positioning school administrators and alumni as active stakeholders in the institutional information ecosystem.

The contribution of this study is threefold. Theoretically, it extends the discourse on educational information systems by framing alumni data management as a mechanism of participatory data governance in secondary education. Methodologically, it demonstrates how needs assessment, system development, and functional validation can be integrated within a community service–based applied research design. Practically, the study offers a replicable and context-sensitive model for schools seeking to modernize alumni data management while strengthening alumni engagement and administrative efficiency. Through this integrated approach, the study contributes to broader discussions on digital transformation and data governance in secondary education systems.

Method

Community Service Design and Partnership Context

This study adopted an applied, community-service-oriented design that integrated participatory needs assessment, system development, and functional evaluation. The methodological framework was structured to address real operational challenges faced by the partner institution while emphasizing stakeholder involvement and practical impact. A senior high school was engaged as an institutional partner, with the school community serving as both beneficiaries and active contributors throughout the program implementation.

Community Participants and Roles

Participants were selected purposively based on their roles in alumni data management and school administration. The core participants included administrative staff responsible for alumni records and alumni representatives who regularly interacted with school services. School administrators acted as key partners in identifying needs, validating system requirements, and supporting implementation, while alumni participated as end users and data contributors. This participatory approach ensured that the developed system aligned with community needs and institutional practices.

Needs Assessment and Community Engagement Procedures

A participatory needs assessment was conducted as the initial phase of the community service program. Direct observations were used to document existing alumni data management practices and identify operational inefficiencies. Semi-structured interviews with administrative staff explored data governance challenges, service limitations, and

expectations regarding system functionality. Questionnaires were distributed to alumni and school staff to capture user perspectives on information accessibility, usability, and data updating processes. These activities facilitated mutual understanding between researchers and the partner institution and informed the design of a contextually relevant solution. A supporting literature review was conducted to align the intervention with prior studies on alumni information systems and digital community services.

System Development and Functional Evaluation

Based on the outcomes of the needs assessment, a web-based alumni data management information system was designed and developed following standard software engineering principles. The system was implemented as a practical solution to support community needs rather than as an experimental prototype. Functional evaluation focused on system reliability and usability from the perspective of community users. Black Box testing was employed to assess whether system features performed according to predefined functional requirements without examining internal code structures (Dashti & Basin, 2020; Ismail & Efendi, 2021). This approach was selected to ensure that the system met operational expectations relevant to daily administrative and alumni activities.

Data Analysis and Program Evaluation

Qualitative data obtained from observations and interviews were analyzed thematically to identify recurring issues related to alumni data management and service effectiveness. Questionnaire responses were analyzed descriptively to summarize user perceptions of system usability and accessibility. Results from Black Box testing were analyzed by comparing observed system outputs with functional specifications to determine feature-level compliance and operational reliability (Peled et al., 1999). The analysis focused on assessing the practical outcomes of the community service intervention, particularly improvements in data accessibility, administrative efficiency, and stakeholder participation.

Results and Discussion

Implementation Outcomes of the Community Service Program

The community service program resulted in the successful implementation of a web-based alumni data management information system at the partner senior high school. Prior to the intervention, alumni records were maintained through paper-based documentation and spreadsheet files managed independently by administrative staff. This practice led to fragmented datasets, delayed updates, limited data accessibility, and a high dependency on physical administrative presence. These conditions constrained the school's capacity to maintain accurate alumni records and to engage alumni systematically in institutional activities.

The implemented system introduced a centralized, web-accessible platform that enabled both school administrators and alumni to participate actively in alumni data management. From an operational perspective, the system facilitated real-time data updating, standardized data formats, and centralized storage, thereby addressing key inefficiencies identified during the needs assessment phase. The involvement of alumni as direct users represented a shift from administrator-centered data control toward a participatory data governance model, which is central to community service–oriented digital interventions.

System functionality was evaluated using Black Box testing to verify whether each feature performed according to predefined functional requirements from the end-user perspective. This evaluation approach is particularly appropriate for community service programs, as it prioritizes usability, functional reliability, and output accuracy over internal technical complexity (Pressman & Maxim, 2020). The authentication mechanism, presented in Figure 1, served as the primary access control feature for both administrators and alumni. Users were required to enter valid credentials registered in the system database, ensuring restricted access to personal alumni data. Such access control mechanisms are aligned with data protection and privacy principles commonly recommended for educational information systems (ISO/IEC, 2018).

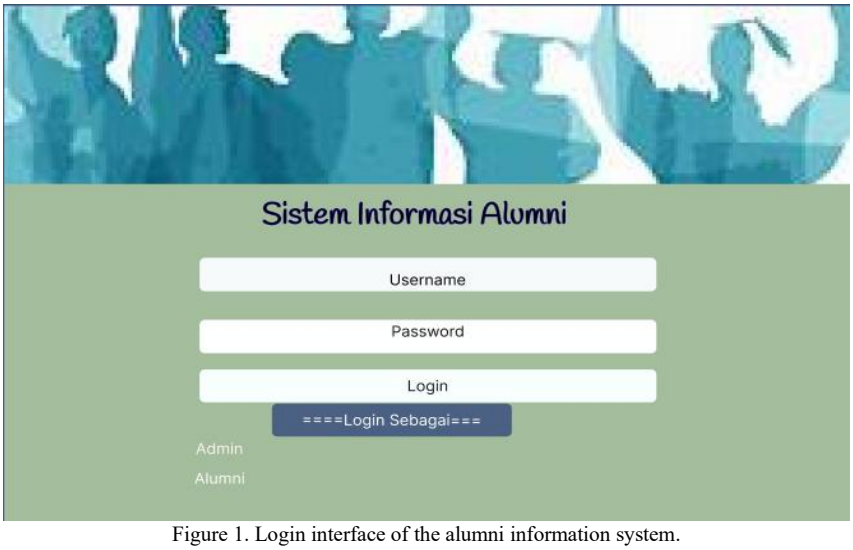

Figure 1. Login interface of the alumni information system.

Following successful authentication, administrators were directed to the system homepage, which functioned as a centralized dashboard for managing alumni-related information. As shown in Figure 2, the dashboard provided structured access to core administrative features, including alumni data visualization, year-based filtering, and event information management. The interface layout was developed through iterative consultation with school administrators to ensure alignment with existing administrative workflows and to minimize the learning curve associated with system adoption.

Figure 2. Administrator homepage after successful login.

The alumni data management interface enabled administrators to add, update, delete, and review alumni records in a standardized format. Figure 3 illustrates the interface used for managing alumni data, including student identification numbers, names, contact information, and enrollment and graduation years. Centralizing these records reduced the risk of data duplication and inconsistency, which are commonly associated with manual and spreadsheet-based data management practices.

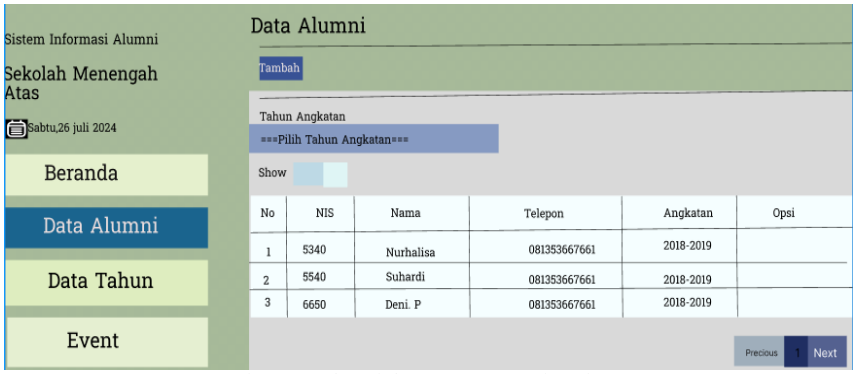

Figure 3. Alumni data management interface.

All figures are intentionally positioned immediately after their initial mention in the text to enhance readability and support visual comprehension, in line with international academic writing conventions for applied and system-based studies.

Functional Validation Results

Following system deployment, functional validation was conducted using Black Box testing to verify the operational performance of the system under typical user interactions. The testing focused on core system functions that are essential for daily administrative and alumni-related activities. The results of the functional validation are summarized in Table 1, which presents the outcomes of Black Box testing across key system features.

Table 1. Blackbox testing results on the system that has been built

No	Description	Testing Activities	Expected results	Information
1	Login Page	User: Fill in username & password and click the login button (Admin and Alumni)	Admin and alumni successfully logged in and were directed to the home page.	Succeed
2	Alumni Home Page	Enter the dashboard page	The application displays a dashboard page containing icons for users to select according to their needs.	Succeed
3	Alumni Data Page	Admin can select the option to add data, edit data and delete data.	Alumni data application	Succeed
4	Add Alumni Data Page	Admin can add alumni data.	Displays the data that has been added.	Succeed
5	Alumni Detail Page	Admin can view alumni data in detail	Display alumni data in detail	Succeed
6	Alumni Data Print Page	Admin can print alumni data	Displays printed alumni data	Succeed

The validation results indicate that all tested system functionalities operated in accordance with predefined requirements, with no critical functional errors identified. These findings confirm that the system is technically reliable and suitable for routine administrative use within the partner school environment. From a community service perspective, this functional reliability is essential to ensure sustained adoption by users and to prevent the reversion to manual data management practices.

Discussion: Community Impact and Alignment with Previous Studies

From a community service standpoint, the implementation of the alumni information system generated tangible improvements in the partner school's administrative practices. The transition from manual data handling to a web-based, self-service model enabled alumni to update their personal information independently, thereby reducing administrative workload and improving data timeliness. This participatory mechanism reflects principles of community empowerment, which emphasize stakeholder involvement in managing shared institutional resources rather than positioning community members as passive service recipients (Cornwall, 2008).

The observed gains in administrative efficiency align with prior studies demonstrating that digital information systems streamline organizational workflows and reduce data redundancy (Fridayanthie & Mahdiati, 2016). They reported that the adoption of information systems significantly improved data processing efficiency in institutional contexts.

Similarly, the present program confirms that centralized web-based platforms can enhance administrative effectiveness in secondary education settings when implemented through a needs-driven and participatory approach.

In terms of alumni engagement, the system facilitated more consistent interaction between the school and its graduates by providing accessible information on events and institutional activities. This outcome supports findings by (Awaludin et al., 2019), who observed that digital alumni platforms increased alumni participation and strengthened institutional relationships. Unlike mobile-only solutions, the web-based approach adopted in this program ensured broader accessibility across devices, which is particularly relevant in community contexts characterized by diverse levels of digital access.

The structured development and validation process applied in this study reflects the importance of systematic system implementation emphasized by (Hartini & Dermawan., 2017). While their work focused primarily on technical development models, the present study extends this perspective by demonstrating how structured system implementation can contribute to institutional capacity building within a community service framework. Additional support for the relevance of web-based alumni information systems is provided by (Rahayu & Supriyono, 2021; Setiawan, 2018), who highlighted the role of web platforms in improving alumni data accuracy and institutional connectivity.

Despite these positive outcomes, the evaluation in this study was limited to functional performance and initial implementation effects. Long-term impacts on data accuracy, user satisfaction, and alumni engagement patterns were not assessed. Future community service initiatives should therefore incorporate longitudinal evaluations to examine system sustainability and evolving community needs. Integrating tracer study features or graduate employment tracking modules may further enhance the system's strategic value for both schools and alumni communities.

Conclusions

This community service program demonstrates that the implementation of a web-based alumni data management information system can effectively strengthen administrative capacity and stakeholder participation in a senior high school context. Beyond introducing a digital tool, the program facilitated a structural transformation in alumni data management practices, shifting from fragmented, administrator-dependent procedures toward a centralized and participatory digital model involving both school staff and alumni.

The findings indicate that the system improved data accessibility, consistency, and timeliness while reducing the administrative burden associated with manual record management. These outcomes underscore the practical value of web-based information systems as instruments for institutional empowerment within educational communities. From a theoretical perspective, the study supports the view that digital information systems can function as enablers of participatory governance, positioning stakeholders as active contributors to institutional information ecosystems rather than passive data subjects. Practically, the system offers a scalable and context-sensitive model for other schools seeking to modernize alumni data management without requiring complex technological infrastructure.

Suggestions

Based on the outcomes of this community service program, several directions for future development and implementation are recommended. First, the system could be enhanced by incorporating alumni tracer studies and career-tracking features to support long-term monitoring of graduate outcomes and strengthen school–alumni relationships beyond data administration. Such extensions would increase the system's strategic value for institutional planning and quality assurance.

Second, further development may include integrating with communication tools, such as notification systems and selected social media platforms, to improve information dissemination and alumni engagement. These features should be carefully designed to protect data privacy and prevent excessive information overload.

Third, future community service initiatives should consider longitudinal evaluations involving user satisfaction, data accuracy over time, and system sustainability. Continuous evaluation would provide deeper insights into the long-term impact of digital interventions on institutional practices and community participation.

Finally, regular system maintenance, security audits, and user training are recommended to ensure data protection, system reliability, and effective adoption by all stakeholders. These efforts are essential to sustain the system's benefits and support its adaptation to evolving institutional needs.

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