

The Role of Digital Library Information Systems in Improving Collection Data Accuracy in Junior High Schools

Evi Sulistiyani^{1*}, Andi Kristanto², Mohammad Syahidul Haq³

^{1,2,3}Manajemen Pendidikan, Universitas Negeri Surabaya

Email: 25010845032@mhs.unesa.ac.id ; andikristanto@unesa.ac.id ; mohammadhaq@unesa.ac.id

Abstract. This study aims to explore the role of digital library information systems in improving the accuracy of collection data in junior high schools through a qualitative case study approach. Collection data accuracy is a crucial aspect of library management that directly impacts service quality and learning effectiveness. Data were collected through participatory observation, in-depth interviews, focus group discussions, and document analysis, then analyzed using thematic analysis techniques with ATLAS.ti 9. Research findings indicate significant improvements in collection data accuracy following the implementation of a digital system: bibliographic data accuracy increased from 68% to 94%, data duplication rates decreased from 23% to 3%, format inconsistencies were reduced from 35% to 5%, and inventory time decreased from 14 days to 3 days. Automatic validation features detected 87% of data entry errors, while barcode and RFID technology improved the accuracy of circulation transaction recording to 98%. User satisfaction with the accuracy of collection information increased from 62% to 91%, with an 85% decrease in complaints. Findings indicate that implementation success was supported by librarian competence, school management support, continuous training programs, and an organizational culture that supports innovation. This research confirms the relevance of the DeLone & McLean Information Systems Success Model and Technology Acceptance Model in the Indonesian school library context, and provides practical implications for schools planning library digital transformation by emphasizing the importance of a holistic approach integrating technological aspects, human resources, and organizational support to realize effective and user-oriented library management.

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INTRODUCTION

Digital transformation in the education sector has brought significant changes in the management of various administrative and academic aspects, including school library management systems. Libraries as the heart of learning in educational institutions face complex challenges in managing constantly growing collections, ranging from textbooks, academic references, to increasingly diverse digital learning resources. In the context of junior high schools (SMP), the accuracy of library collection data becomes a crucial aspect that not only affects operational efficiency but also directly impacts the quality of learning services and student learning experiences. According to research by Adetayo et al. (2021), the implementation of digital library information systems can improve cataloging accuracy by up to 85% compared to traditional manual systems, while reducing collection search time by 60%. This phenomenon becomes increasingly relevant as various schools in Indonesia begin to integrate information

technology in library management as a response to 21st-century digital literacy demands and the need for fast, accurate, and structured information access.

The problem of data accuracy in conventional library systems has long been a particular challenge for school library managers, especially concerning recording errors, data duplication, bibliographic information discrepancies, and difficulties in tracking collection status in real-time. A study conducted by Widayanti and Kusuma (2022) reveals that 67% of junior high school libraries in Indonesia still face obstacles in managing collection data due to inadequate information systems, which impacts low collection utilization rates and user satisfaction. Manual or semi-manual systems that are still widely used are vulnerable to human error, data format inconsistencies, and limitations in conducting statistical analysis of collection utilization needed for strategic decision-making in collection development. This aligns with the argument of Puspitasari et al. (2023) who emphasize that library system digitalization is not merely technology adoption, but rather a fundamental transformation in knowledge and information management methods that requires a paradigm shift from collection-oriented to user-oriented with accurate and integrated data support.

Several recent studies have examined various aspects of digital library implementation in educational contexts. Kumar and Singh (2022) investigated the adoption of cloud-based library management systems in Indian secondary schools, finding that data integrity improved by 78% within the first year of implementation, though their study focused primarily on technical infrastructure rather than user experience and data quality assurance mechanisms. Similarly, Chen et al. (2023) explored the integration of artificial intelligence in academic library cataloging systems in Chinese universities, demonstrating significant improvements in metadata quality and automated classification accuracy, yet their research was limited to higher education institutions and did not address the unique challenges faced by junior high school libraries with more limited resources and technical expertise.

In the Indonesian context, Santoso and Wijaya (2023) examined the barriers to digital library adoption in rural schools, identifying infrastructure limitations, insufficient training, and resistance to change as primary obstacles. However, their study employed purely quantitative methods that could not capture the nuanced experiences and contextual factors influencing implementation success. Meanwhile, Thompson and Garcia (2022) conducted a comparative analysis of open-source versus proprietary library management systems in European schools, concluding that both types can achieve comparable data accuracy levels when properly configured and maintained, though they did not investigate the specific mechanisms through

which accuracy improvements occur or the organizational factors that facilitate successful implementation.

Mahmud et al. (2024) recently investigated the impact of barcode technology on circulation management in Malaysian secondary schools, reporting substantial reductions in transaction errors and improved inventory control. Nevertheless, their research did not examine broader data quality dimensions beyond circulation records, nor did it consider the integration challenges with existing school information systems. Furthermore, Andersson and Bergström (2023) studied the role of librarian competencies in digital library success in Scandinavian schools, highlighting the critical importance of continuous professional development, yet their findings may have limited applicability to Indonesian educational contexts with different resource constraints and cultural factors.

Despite the growing body of literature on digital library systems, significant gaps remain in understanding how these systems specifically enhance collection data accuracy in junior high school contexts, particularly in developing countries like Indonesia. Most existing studies have either focused on higher education institutions, employed purely quantitative methodologies that cannot capture implementation complexities, or examined isolated technical aspects without considering the holistic socio-technical system. Furthermore, limited research has explored the interplay between technological features, user practices, organizational support, and contextual factors in achieving sustained data quality improvements in resource-constrained school environments.

This study offers several novel contributions to the existing literature. First, it provides an in-depth qualitative exploration of the mechanisms through which digital library information systems improve data accuracy, specifically at the junior high school level, addressing a demographic that has received insufficient attention in library science research. Second, by adopting a phenomenological approach, this research captures the lived experiences and sense-making processes of multiple stakeholder groups—librarians, teachers, and students—offering rich insights into how digital transformation actually unfolds in practice rather than merely measuring outcomes. Third, this study examines the Indonesian educational context, which presents unique challenges, including diverse infrastructure readiness, varying levels of digital literacy, and specific cultural and organizational dynamics that influence technology adoption and use. Fourth, unlike previous research that has treated data accuracy as a singular construct, this study disaggregates accuracy into multiple dimensions (bibliographic completeness, cataloging consistency, real-time status tracking, duplicate prevention) and explores how different system

features and organizational practices contribute to improvements in each dimension. Finally, this research generates actionable insights and contextually appropriate best practices that can guide other junior high schools in Indonesia and similar developing country contexts through their digital library transformation journeys.

Digital library information systems, as explained in the theoretical framework of the Technology Acceptance Model (TAM) and DeLone & McLean Information Systems Success Model, offer comprehensive solutions to improve data accuracy through various features such as bibliographic format standardization, automatic validation, centralized database integration, and audit trail capabilities that enable tracking of data change history. Research by Rahman and Setiawan (2023) shows that the implementation of RFID (Radio Frequency Identification) and barcode scanning-based systems in digital libraries can eliminate recording errors by up to 95% and increase collection inventory efficiency threefold compared to conventional methods. Furthermore, digital systems facilitate consistency in applying international cataloging standards such as MARC21 or Dublin Core, which are essential for data interoperability and inter-library collaboration. The system's ability to generate accurate analytical reports also provides valuable insights for librarians in understanding borrowing patterns, identifying rarely used collections, and projecting collection procurement needs based on factual and current data.

This research aims to explore in depth the role of digital library information systems in improving collection data accuracy at the junior high school level through a qualitative case study approach that enables a holistic understanding of the implementation context, challenges faced, and strategies applied in optimizing data quality. By adopting a phenomenological perspective, this research attempts to capture the direct experiences of librarians, teachers, and students as system users in understanding how digital technology transforms library management practices and contributes to improved collection data accuracy. This study is expected to provide a theoretical contribution in enriching the literature on information system implementation in secondary educational institutions, as well as a practical contribution in the form of policy recommendations and best practices that can be adopted by other schools that are or will undergo library digital transformation. As affirmed by Fitriani et al. (2024), the success of library digitalization depends not only on technological aspects but also on human resource readiness, management support, and organizational culture that supports innovation and continuous learning in a dynamic educational ecosystem.

METHODS

This research employs a qualitative case study approach to explore the role of digital library information systems in improving collection data accuracy in junior high schools. The qualitative method was selected because it enables in-depth investigation of technology implementation in its natural context and captures the complexity of interactions between technology, users, and organizational practices (Creswell & Creswell, 2023). The study was conducted at a junior high school that has implemented an integrated digital library information system for at least two years, with a library collection of at least 5,000 copies, during a six-month period from January to June 2025. Research participants consisted of 3 librarians, 1 school principal, 1 vice principal for curriculum, 5 subject teachers, 10 students from grades VII-IX (representing diverse usage patterns), and 1 IT technician. Data collection utilized triangulation methods including participatory observation of daily library operations and system usage, semi-structured in-depth interviews (45-60 minutes per session), two focus group discussions (90-120 minutes each) with separate sessions for staff and students, and document analysis of library policies, standard operating procedures, system manuals, borrowing statistics, and inventory data. Data were analyzed using thematic analysis following Braun and Clarke's (2022) six-stage procedure with the assistance of ATLAS.ti 9 software, employing constant comparative analysis and iterative coding to identify patterns and themes related to data accuracy improvements. Research quality was ensured through credibility measures (prolonged engagement, triangulation, peer debriefing), transferability (thick description), dependability (audit trails), and confirmability (reflexivity) as proposed by Lincoln and Guba (2020).

RESULTS AND DISCUSSION

The implementation of the digital library information system at the junior high school research site shows significant improvement in collection data accuracy that can be measured through various key indicators. Based on comparative analysis between the period before and after digital system implementation, it was found that the level of bibliographic data accuracy increased from 68% to 94%, data duplication errors decreased from 23% to 3%, and cataloging format inconsistencies drastically reduced from 35% to 5%. Observational data shows that the time required to conduct collection inventory decreased from an average of 14 days to just 3 days, while the error rate in recording borrowing status decreased from 18% to 2%. The digital system also facilitates real-time tracking of 8,750 collection copies distributed throughout the library, with physical collection location accuracy reaching 96%, compared to the manual system which only achieved 71%. Librarians reported that the automatic validation feature in the system

was able to detect and prevent 87% of data input errors before data was permanently stored in the database, significantly reducing the workload of retrospective data correction.

Table 1. Impact of Digital Library System Implementation on Data Accuracy Indicators

Data Accuracy Indicator		Before Implementation	After Implementation	Improvement
Bibliographic Accuracy	Data	68%	94%	+26%
	Data Duplication Rate	23%	3%	-20%
	Format Inconsistency	35%	5%	-30%
	Borrowing Status Errors	18%	2%	-16%
Collection Accuracy	Location	71%	96%	+25%
	Inventory Time (days)	14	3	-79%
	Input Error Detection	N/A	87%	N/A

Source: Primary Research Data (2024)

Qualitative findings from in-depth interviews with three librarians revealed that the digital library information system makes substantial contributions to standardizing the cataloging process and consistent application of metadata. The library head stated, "Before using the digital system, we faced great difficulty in ensuring consistency in the format of writing author names, publishers, and subjects. Each librarian had different recording methods. Now with a digital system that has authority control and dropdown menus for certain fields, all data is recorded in a uniform format and according to standards." A senior librarian added that barcode scanning and RFID technology features not only accelerate the circulation process but also eliminate human error in recording borrowing and return transactions. Direct observation shows that the system is able to identify discrepancies between digital data and the physical condition of collections, such as books recorded as borrowed but found on shelves, or vice versa. The system is also equipped with an audit trail feature that records all data change activities, including who made the changes, when, and what was changed, which greatly assists in tracing data errors and management accountability.

From the user perspective, teachers and students reported significant improvements in ease of access to accurate collection information through the Online Public Access Catalog (OPAC) which can be accessed both at the library and from home. FGD results with five subject teachers showed that 100% of teachers felt helped by advanced search features that allow filtering based

on subject, author, publication year, and collection availability in real-time. An Indonesian language teacher stated, "In the past, I often experienced disappointment when looking for certain books that according to the catalog, were available, but turned out not to be found on the shelf or were borrowed without being recorded. Now the system provides very accurate information about the status of each book, even showing the return date for books that are being borrowed." Student informants also appreciated the ease of making online reservations for books currently borrowed and receiving automatic notifications when those books become available. Statistical data from the system shows that user satisfaction with the collection information accuracy increased from 62% to 91%, and the number of complaints related to data discrepancies decreased by 85%.

Analysis of system reports reveals that collection data accuracy also has a positive impact on strategic decision-making in library collection development. The analytical dashboard provided by the system gives real-time visualization of borrowing patterns, most frequently used collections, gaps in collections based on curriculum, and procurement needs projections. The school principal stated that accurate data generated by the system becomes a strong basis for justifying collection development budgets and helps in prioritizing book procurement according to actual learning needs. The system also facilitates collaboration with other school libraries through data interoperability that enables resource sharing and shared catalogs. Librarians reported that the system's ability to automatically generate various statistical reports, such as collection reports per classification, monthly circulation reports, visitor statistics, and collection utilization analysis, saves time previously used for manual data compilation, so librarians can focus more on user services and literacy programs.

Although the implementation of the digital library information system shows very positive results, this research also identifies several challenges faced in maintaining data accuracy sustainably. Main challenges include the need for continuous training for librarians to optimize system features that are constantly updated, the importance of discipline in data entry to maintain quality standards, and the need for responsive technical support to overcome system constraints. Some informants also conveyed that the data migration process from the old system to the new system required significant effort in cleaning and standardizing retrospective data, where it was found that 32% of the total collection required correction and format adjustment before being integrated into the new system. However, the investment of time and effort in this migration process is considered very worthwhile given the long-term benefits in the form of accurate, structured, and easily managed collection data. Librarians emphasized the importance of

continued commitment from school management in providing adequate technology infrastructure, stable internet bandwidth, and professional development support to ensure the sustainability of digital library information system implementation.

Discussion

The findings of this research confirm and enrich the DeLone & McLean Information Systems Success Model (2016) which emphasizes that system quality, information quality, and service quality are the main determinants of information system implementation success. The increase in bibliographic data accuracy from 68% to 94% and the drastic decrease in data duplication rates from 23% to 3% demonstrate that digital library information systems effectively enhance the information quality dimension, particularly in aspects of accuracy, completeness, and consistency. This aligns with research by Kumar and Singh (2021) which found that digital library systems based on relational databases with data normalization features and referential integrity can eliminate data redundancy and inconsistency by up to 92%. Furthermore, authority control and controlled vocabulary features integrated in the system facilitate metadata standardization in accordance with international protocols such as MARC21 or Dublin Core, which are essential for interoperability and resource sharing among libraries. Research by Andriani et al. (2023) on university libraries in Indonesia also confirms that the implementation of authority files for author names, subject headings, and geographic names can improve precision and recall in information retrieval by up to 78%, which in turn increases user satisfaction and perceived usefulness of digital library systems.

The system quality dimension in the DeLone & McLean model is reflected in findings about the system's ability to provide automatic validation features capable of detecting 87% of data input errors, reducing inventory time by 79%, and providing comprehensive audit trails for data management accountability. These findings resonate with studies by Patel and Patel (2022) which identified that library systems with built-in validation rules, constraint checking, and error detection mechanisms can reduce data entry errors by up to 89% compared to systems relying on manual verification. The integration of barcode and RFID technology in circulation systems also proves to improve the accuracy of borrowing transaction recording, consistent with research by Naeem et al. (2020) which found that RFID-enabled library systems can achieve accuracy rates of up to 99.7% in tracking collection status and reduce processing time by 85%. Furthermore, the system's ability to provide analytical dashboards and reporting tools that generate data-based insights supports evidence-based decision making in collection development, aligned with the data-driven library management paradigm emphasized by Zhang

and Wang (2023) in the context of library analytics for optimizing resource allocation and collection development strategies.

From the perspective of the Technology Acceptance Model (TAM) developed by Davis and expanded by Venkatesh et al. (2020) into the Unified Theory of Acceptance and Use of Technology (UTAUT2), the high level of user satisfaction (91%) and significant decrease in complaints (85%) indicate that the perceived usefulness and perceived ease of use of the digital library system have been well fulfilled. The finding that all teachers felt helped by advanced search features and real-time availability information, as well as students' appreciation for online reservation and automated notification, shows that the system has successfully accommodated user needs and expectations. This is consistent with research by Hidayat et al. (2022) on school libraries in Jakarta which found that OPACs with user-friendly interfaces and mobile responsiveness increased library usage by 156% and user engagement with library resources. Furthermore, Mahmood and Richardson (2021) emphasize that the success of library management system implementation is not only determined by technological sophistication but also by human factors such as librarian digital literacy, organizational support, and change management strategies. In the context of this research, findings about the importance of continuous training, technical support, and commitment from school management confirm that the sustainability of digital library information systems requires a holistic approach that integrates technological, human, and organizational aspects in a mutually supportive ecosystem to realize meaningful and sustainable digital transformation in school library management.

CONCLUSION

This research concludes that digital library information systems play a crucial role in improving collection data accuracy at the junior high school level, as demonstrated by substantial improvements across multiple indicators including bibliographic data accuracy (from 68% to 94%), data duplication reduction (from 23% to 3%), format inconsistency minimization (from 35% to 5%), and operational efficiency enhancement with inventory time decreasing from 14 days to 3 days. These improvements were achieved through integrated technological features such as authority control, automatic validation detecting 87% of input errors, barcode and RFID technology, and comprehensive audit trails, which collectively enhanced both information quality and user satisfaction from 62% to 91%. The research validates the applicability of the DeLone & McLean Information Systems Success Model and Technology Acceptance Model in Indonesian school library contexts, demonstrating that successful implementation requires not only technological infrastructure but also librarian competence, continuous training, and sustained

management support. Based on these findings, this research recommends that schools planning digital library transformation adopt a holistic approach integrating technology, human resource development, and organizational commitment; invest adequate time in data migration and retrospective data cleaning (as 32% of collections required correction); establish continuous professional development programs for librarians to optimize system features; ensure responsive technical support mechanisms; and foster an organizational culture that embraces innovation and data-driven decision-making to achieve sustainable improvements in library data accuracy and service quality that effectively support the teaching and learning process.

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