MIKAILALSYS
Journal of Multidisciplinary Sciences

e-ISSN : 2987-2286
p-ISSN : 2987-3924
Index: Harvard, Boston, Sydney, Copernicus, Sinta 4, Scilit, Semantic, Google, etc

https://doi.org/10.58578/mikailalsys.v4i3.12758

The Impact of Data Duplication on Circulation Services at the Agam Regency Archives and Library Service

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Submitted:	Revised:	Accepted:	Published:
Oct 11, 2026	Nov 9, 2026	Nov 20, 2026	Nov 25, 2026

Abstract

Re-entering manually recorded transactions into library automation systems may generate duplicate records, resulting in data inconsistencies and service delays. This study examined data duplication and circulation services at the Agam Regency Archives and Library Service and analysed the relationship between these variables. A quantitative causal-associative design was employed, involving 100 library users selected through convenience sampling. Data were collected using a Likert-scale questionnaire and analysed using descriptive statistics, Pearson's product–moment correlation, and simple linear regression. The mean scores for data duplication and circulation services were 1.30 and 1.40, respectively, both classified as poor. The analysis revealed a statistically significant positive relationship between the two measures ($r = 0.304$, $p = .002$), with a regression coefficient of 0.520. Data duplication accounted for 9.2% of the variance in circulation services ($R^2 = 0.092$), indicating limited explanatory power and suggesting that other factors also contribute to service performance. The findings highlight the importance of improving library data management through systematic reviews of transaction recording procedures, stronger system integration and synchronisation, and regular record updates to enhance the accuracy, efficiency, and effectiveness of circulation services.

Keywords: Data Duplication; Circulation Services; Public Libraries; Library Automation Systems; Service Quality

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INTRODUCTION

Advances in information technology have encouraged libraries to adapt their information management practices and public service delivery. This transformation is reflected in the shift from conventional procedures towards automated systems that facilitate more efficient and structured data management. In this context, data quality is a fundamental consideration because it determines the reliability of information generated by library systems (Shahbazi et al., 2019). Effective information management also contributes to broader public access to knowledge resources and library services (IFLA & TASCHA, 2019). Furthermore, integrated library management systems are essential for coordinating the administration of collections, membership records, and circulation transactions (Ayo et al., 2023).

Public libraries play an important role as information service institutions that provide knowledge resources to diverse segments of society. Their responsibilities extend beyond collection provision to include literacy development, lifelong learning, and community participation (Boimau et al., 2023). Libraries also serve as spaces for community development by facilitating educational activities and information exchange (Mahdi, 2023). As societal needs continue to evolve, public libraries are expected to introduce service innovations that respond to changing social and technological environments (Desmarchelier et al., 2025). Consequently, reliable and accurate information systems have become essential to maintaining effective library operations and service delivery.

Circulation is one of the primary library services involving direct interaction between library staff and users. It encompasses borrowing, returning, renewing materials, and managing membership and collection records (Anshari, 2021). Systematic circulation management is necessary to ensure that transactions are properly recorded and library collections remain accessible to users (Sumiyati & Wijaya, 2023). The implementation of structured service procedures also contributes to more effective transaction management and improved user satisfaction (Setyaningsih et al., 2024). Therefore, circulation service quality depends not only on interactions between staff and users but also on the accuracy and consistency of the data supporting these activities.

One significant challenge in circulation management is data duplication. Data duplication occurs when identical information is stored more than once within a database, resulting in redundancy and potentially compromising data consistency (Connolly & Begg, 2015). Such problems may arise during library automation, particularly when data

management processes lack adequate validation and control mechanisms (Asari et al., 2020). Database systems, however, play a crucial role in maintaining information integrity, organization, and accessibility within library operations (Adriansyah & Nasution, 2024). Poorly integrated data management may lead to repeated records, inconsistencies in transaction information, and additional verification tasks for library staff.

Within library services, data duplication should be regarded as an information management problem that may undermine system reliability and operational effectiveness. Inconsistent data management can generate errors during data entry and updating, highlighting the need for structured information management practices (Nasution et al., 2025). Technology-based library data management systems have also been developed to minimize recording errors and improve the efficiency of borrowing transactions (Rahman & Wibisono, 2026). Research on library management applications further demonstrates the importance of data integration in maintaining consistent membership and collection information (Mardiawati et al., 2024). These conditions indicate that successful library automation depends not merely on technological adoption but also on the quality and consistency of the underlying data.

To assess circulation services from the users' perspective, this study employs the End-User Computing Satisfaction (EUCS) model. Originally developed by Doll and Torkzadeh (1988), EUCS provides a framework for evaluating users' satisfaction with information systems based on their experience of system performance. Its application in educational environments demonstrates the relevance of assessing how effectively information systems address users' needs and expectations (Padalia & Natsir, 2022). The model has also been applied to evaluate user satisfaction with library information systems, particularly in relation to information quality and the overall user experience (Suwanti & Yudhana, 2022). In this study, EUCS is operationalized through five dimensions: content, accuracy, format, ease of use, and timeliness, providing a framework for assessing circulation services from library users' perspectives.

Previous studies have examined library service quality and user satisfaction through various approaches. Khoirunissa et al. (2023) investigated user satisfaction with public library circulation services using the LibQUAL approach. Saputra et al. (2025) examined the impact of digital transformation on circulation service satisfaction by integrating LibQUAL and EUCS. Meanwhile, Trihapningsari et al. (2026) assessed service quality and user satisfaction

at Universitas Terbuka's Virtual Reading Room through a combination of SERVQUAL and EUCS. Although these studies contribute to the understanding of library service quality, the role of data management problems, particularly data duplication within circulation processes, requires further investigation.

The **research gap** addressed in this study concerns the limited empirical examination of how data duplication affects circulation services in public libraries that employ hybrid data management practices. Previous research on library automation has primarily emphasized technological efficiency and service quality, without specifically examining data duplication as an independent variable associated with circulation services. Research on INLISLite implementation, for example, has focused on the efficiency of information system utilization in library service management (Hidayat et al., 2025). Similarly, studies of library automation have highlighted the role of technological implementation in improving circulation service effectiveness (Abidin & Sudirman, 2022). Accordingly, further investigation is needed to establish an empirical connection between data quality problems and users' experiences of circulation services.

The **novelty** of this study lies in examining data duplication as an independent variable associated with circulation services through the EUCS framework in a public library that continues to combine manual and digital recording procedures. The research is specifically conducted at the Agam Regency Archives and Library Office, where circulation transactions involve recording information in physical ledgers before entering the same information into the library automation application. This operational context is particularly relevant because the efficiency of regional library services is closely related to the reliability of their information management systems (Christiana et al., 2024). Technology-supported circulation services must also ensure that information is accurate, consistent, and accessible to users (Fitri et al., 2025). Furthermore, library automation initiatives emphasize the importance of integrating collection management and service processes to improve overall library performance (Mustikawati et al., 2023).

Accordingly, this study focuses on examining the effect of data duplication on circulation services at the Agam Regency Archives and Library Office. Data duplication is assessed through three indicators: input inconsistency, system integration and synchronization, and database system performance. Circulation services are evaluated using the five EUCS dimensions of content, accuracy, format, ease of use, and timeliness. The

objectives are to identify the condition of data duplication, assess the condition of circulation services, and analyze the effect of data duplication on circulation services. The findings are expected to contribute empirical insights to library and information science research while providing practical considerations for improving data management procedures and enhancing the quality of library services.

METHODS

This study employed a quantitative approach using a causal-associative research method. The quantitative approach was selected to measure the research variables numerically and examine their relationships through statistical analysis. The causal-associative method was applied to investigate the effect of data duplication as the independent variable (X) on circulation services as the dependent variable (Y) at the Agam Regency Archives and Library Office. The research design focused on establishing empirical evidence regarding the relationship between these variables and the extent to which data duplication influences circulation services.

Data duplication was assessed through three indicators: input inconsistency, system integration and synchronization, and database system performance. These indicators were used to examine issues in data management, particularly those associated with recording and processing information. Circulation services, meanwhile, were measured using five indicators: content, accuracy, format, ease of use, and timeliness. These dimensions were based on the End User Computing Satisfaction (EUCS) model, which provides a framework for evaluating users' satisfaction with the information and services generated by an information system. Both variables were operationalized according to these predetermined indicators.

The study population comprised all library users who accessed circulation services at the Agam Regency Archives and Library Office. Since the number of users conducting circulation transactions varied daily and the exact population size could not be established due to the coexistence of physical and digital record-keeping, the sample size was calculated using the Lemeshow (Cochran) formula. At a 95% confidence level and a 10% margin of error, the minimum required sample was 96 respondents. This figure was rounded up to 100 respondents. Participants were selected through non-probability sampling using the

accidental sampling technique. Accordingly, respondents were recruited from library users encountered at the research site who were willing to participate.

Data were collected using a structured questionnaire developed from the indicators of both research variables. The instrument consisted of 24 statements, comprising nine items measuring data duplication and 15 items measuring circulation services. Responses were recorded on a four-point Likert scale, ranging from strongly disagree to strongly agree. Instrument validity was examined using Pearson's Product-Moment correlation at a significance level of 0.05. All questionnaire items were considered valid, as their calculated correlation coefficients exceeded the critical value of 0.361. Reliability was assessed using Cronbach's Alpha with SPSS. The resulting coefficients were 0.734 for data duplication and 0.845 for circulation services, indicating that both variables met the study's reliability criteria.

Primary data were obtained by distributing questionnaires to the selected respondents. Secondary data were gathered from relevant internal library documents, including visitor statistics, collection records, and annual circulation reports. The questionnaire responses were subsequently tabulated and converted into numerical scores. Negatively worded statements were reverse-coded before further analysis. Data analysis comprised descriptive and inferential statistics. Descriptive analysis involved frequencies, percentages, and mean scores to summarize respondents' assessments of both variables. Inferential analysis employed simple linear regression to examine the effect of data duplication on circulation services. Normality, linearity, and correlation tests were conducted before hypothesis testing. The hypothesis was evaluated at a significance level of 0.05, while the coefficient of determination was used to establish the proportion of variation in circulation services explained by data duplication.

RESULTS

1. Classical Assumption Tests

a. Normality Test

Table 1. Results of the Normality Test

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		100
	Mean	0000000

Normal Parameter[ab]	Std.Deviation		2.37599536
Most Extreme Differences	Absolute		.079
	Positive		.077
	Negative		-.079
Test Statistics			.079
Asymp. Sig. (2-tailed)[c]			130
Monte Carlo Sig. (2-tailed)[e]	Sig.		.129
	99% Confidence Interval	Lower Bound	.129
		Upper Bound	.121
a. Test distribution is Normal.			
b. Calculated from data.			
c. Lilliefors Significance Correction.			
d. This is a lower bound of the true significance.			
e. Lilliefors' method based on 10000 Monte Carlo samples with starting seed 2000000.			

source: Compiled by the researcher (2026)

Table 1. Results of the Normality Test shows that the Asymp. Sig. value is reported as 0.130 in the accompanying explanation, which is greater than the significance level of 0.05. Therefore, the residuals are considered normally distributed, indicating that the normality assumption is satisfied.

b. Linearity Test

Table 2. Results of the Linearity Test

ANOVA Table							
			Sum of Square	df	Mean Square	F	Sig.
Data Duplication * Circulation Services	Between Groups	(Combined)	196.015	7	28.002	6.079	<,001
		Linearity	165.653	1	165.653	35.963	<,001
		Deviation From Linearity	30.363	6	5.060	1.099	.369
	Within Groups		423.775	92	4.606		
	Total		619.790	99			

source: Compiled by the researcher (2026)

Table 2. Results of the Linearity Test shows that the significance value for Deviation from Linearity is 0.369, which exceeds the 0.05 threshold. This indicates a linear relationship between Data Duplication (X) and Circulation Services (Y). Thus, the linearity assumption is satisfied.

4. Hypothesis Testing

a. Correlation Test

Table 3. Results of the Pearson Correlation Test

Correlations			
		Data Duplication	Data Duplication
Data Duplication	Pearson Correlation	1	.304**
	Sig.(2-Tailed)		.002
	N	100	100
Circulation Services	Pearson Correlation	.304**	1
	Sig.(2-Tailed)	.002	
	N	100	100
.Correlation is significant at the 0.001 level (2 tailed).			

source: Compiled by the researcher (2026)

Table 3. Results of the Pearson Correlation Test shows that the correlation coefficient (r) between Data Duplication and Circulation Services is 0.304, with a significance value of 0.002. Since the significance value is below 0.05, the relationship between the two variables is statistically significant. The positive correlation coefficient indicates that the variables are positively associated.

b. Simple Linear Regression

Table 4. Results of the Simple Linear Regression Test

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	f	Sig.
1.	Regression	152.584	1	152.584	9.948	.002[b]
	Residual	1503.206	98	15.339		
	Total	1655.790	99			
a. Dependent Variable: Circulation Services						
b. Predictors: (Constant), Data Duplication						

source: Compiled by the researcher (2026)

Table 4. Results of the Simple Linear Regression Test shows that the calculated F value is 9.948, with a significance value of 0.002. Since this value is below 0.05, the regression model is statistically significant. Therefore, the null hypothesis (H_0) is rejected, indicating that Data Duplication (X) has a statistically significant effect on Circulation Services (Y).

Table 5. Results of the Simple Linear Regression Coefficients Test

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std.Error	Beta	t	Sig.
1.	(Constant)	14.899	2.008		7.420	<,001
	Data Duplication	.520	.165	.304	3.154	.002
a. Dependent Variable: Circulation Services						

source: Compiled by the researcher (2026)

Table 5. Results of the Simple Linear Regression Coefficients Test shows that Data Duplication has a regression coefficient (B) of 0.520, a t-value of 3.154, and a significance value of 0.002. Since the significance value is below 0.05, Data Duplication has a statistically significant effect on Circulation Services. The standardized beta coefficient is 0.304, indicating a positive association between the variables.

c. Coefficient of Determination Test

Table 6. Results of the Coefficient of Determination Test for Variables X and Y

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.304[a]	.092	.083	3.916
a. Predictors: (Constant), Data Duplication				

source: Compiled by the researcher (2026)

Table 6. Results of the Coefficient of Determination Test for Variables X and Y shows that the R Square value is 0.092, indicating that Data Duplication explains 9.2% of the variation in Circulation Services. The remaining 90.8% is attributable to other factors outside the research model (residual error).

DISCUSSION

The findings indicate that both data duplication and circulation services at the Agam Regency Archives and Library Office were rated poorly. Data duplication obtained a mean score of 1.30, while circulation services received a mean score of 1.40. These results suggest that data-management problems extend beyond the technical storage of information and are associated with users' experiences when accessing library services. This relationship is important because circulation activities depend on accurate and consistently updated information about library members, collections, and transactions. When data are not

managed effectively, service processes may encounter difficulties in information retrieval, member verification, and the recording of borrowing and return transactions.

The data duplication variable was examined through three indicators: input inconsistency, system integration and synchronization, and database system performance. Their respective mean scores were 1.28, 1.33, and 1.30, indicating similarly poor assessments across all three aspects. This pattern suggests that data-management problems are not limited to the initial entry of information but also involve the maintenance and updating of records. The practice of recording circulation transactions in physical ledgers before entering the same information into the library automation application creates repeated recording activities. If these two recording media are not updated consistently, discrepancies may arise between physical and digital records. Such discrepancies can complicate data verification and make it more difficult for staff to ensure that transaction information is accurate. Data duplication should therefore be understood as an information-management issue that may affect the consistency and reliability of records used in library operations.

The findings concerning circulation services further demonstrate the importance of information quality in shaping users' experiences. All five dimensions of the End-User Computing Satisfaction (EUCS) model—content, accuracy, format, ease of use, and timeliness—were rated poorly. Content and accuracy each obtained a mean score of 1.39, while format and ease of use both received 1.43. Timeliness recorded a mean score of 1.38. The low content score suggests that information about borrowing histories, collection availability, and circulation transactions does not fully meet users' needs. In terms of accuracy, discrepancies between displayed information and actual transaction conditions may reduce users' confidence in the reliability of the system. The results for format and ease of use indicate that information is not always presented in a sufficiently clear or accessible manner. Meanwhile, weaknesses in timeliness may require users to seek direct confirmation from library staff when transaction information has not been updated. These findings suggest that circulation-service quality depends not only on the availability of an automation application but also on the quality of the information managed and presented through the system.

The statistical analysis identified a significant relationship between data duplication and circulation services. The Pearson correlation coefficient was 0.304, with a significance value of 0.002, indicating a positive relationship of relatively low strength. Simple linear

regression produced a coefficient of 0.520, a t-value of 3.154, and a significance value of 0.002. These results indicate a statistically significant relationship between the measured data-duplication and circulation-service scores. Nevertheless, the positive direction of the relationship must be interpreted in accordance with the coding of the questionnaire items. The coefficient of determination, $R^2 = 0.092$, indicates that data duplication accounts for 9.2% of the variation in circulation-service scores, while the remaining 90.8% is associated with factors not included in the research model. This suggests that data duplication is one factor related to circulation services, but it does not independently determine overall service quality.

These findings extend Suwanti's (2022) study, which applied the EUCS model to assess user satisfaction with library information systems. The use of the same model allows system quality to be examined through users' assessments of information content, accuracy, presentation, ease of use, and timeliness. However, the present study differs by specifically examining data duplication as a factor associated with circulation services rather than evaluating the automation system in general. The findings can also be considered alongside Khoirunissa's (2023) research, which identified gaps between users' perceptions and expectations of circulation-service quality in a public library. Whereas Khoirunissa focused on users' assessments of service quality, the present study considers an internal data-management issue that may be associated with those experiences. Saputra (2025) found that digital transformation could positively influence user satisfaction with circulation services. The present findings complement this perspective by indicating that technology adoption needs to be accompanied by effective data management if digital systems are to support service delivery optimally. Trihapningsari (2026) also provides a relevant comparison through the use of SERVQUAL and EUCS to evaluate digital library services. The present study extends this discussion to a regional library environment in which manual and digital recording practices are still used simultaneously.

In relation to database management, the findings are consistent with Connolly and Begg's (2015) explanation of data redundancy and inconsistency arising from weaknesses in database management and design. This perspective highlights the importance of maintaining consistent information so that records used in operational activities remain reliable. Abidin and Sudirman (2022) emphasize the benefits of automation in supporting accurate transaction recording, while Mustikawati et al. (2023) explain how automation systems can assist library activities that were previously performed manually. Eliza et al. (2023) further

highlight the importance of infrastructure and human-resource readiness in developing integrated systems. Taken together, these studies support the view that technology-based service performance depends not only on the availability of applications but also on effective data management and adequate operational resources. The main contribution of the present study lies in examining the relationship between data duplication and circulation services from the perspective of library users in a regional institution that continues to employ a hybrid recording system.

From a theoretical perspective, this study contributes to library and information science by examining the relationship between database-management quality and users' assessments of circulation services. Combining data-duplication indicators with the five EUCS dimensions provides a perspective in which digital service quality is understood as depending not only on application features but also on the consistency of the information supporting daily operations. In practical terms, the findings provide an evaluative basis for the Agam Regency Archives and Library Office to improve its data-management procedures. Relevant measures include reviewing transaction-recording practices, establishing an authoritative data source, identifying repeated member and collection records, and ensuring that borrowing and return statuses are updated consistently. The implementation of library automation should also be supported by adequate infrastructure, clearly defined operating procedures, and continuous staff development. Improving service quality therefore requires more than investing in technology; it also requires improvements in data governance and service implementation.

Several limitations should be considered when interpreting these findings. The use of accidental sampling involving 100 respondents limits the generalizability of the results because participants were selected according to their accessibility and willingness to take part in the study. In addition, the primary data were collected through questionnaires, meaning that the results represent users' perceptions rather than a direct technical examination of all records in the library database. The study was also conducted at a single institution with a specific service and system configuration, and its findings may not be directly applicable to other libraries. Furthermore, the research model included data duplication as its sole independent variable, while the coefficient of determination indicates that most variation in circulation-service scores is associated with factors outside the model. Future studies could employ more representative sampling and combine questionnaires with database audits and interviews with library staff. They could also examine additional factors, including librarian

competencies, technological infrastructure, and the implementation of operating procedures, to develop a more comprehensive understanding of the relationship between data management and circulation-service quality.

CONCLUSION

The findings demonstrate that data management and circulation services at the Agam Regency Archives and Library Service continue to face several operational challenges. Data duplication received an overall mean score of 1.30, placing it in the poor category. These conditions were reflected in input inconsistency, system integration and synchronization, and database performance. The practice of recording transactions manually before re-entering them into the library automation application may contribute to duplicate entries and inconsistencies in recorded information. Circulation services also fell into the poor category, with an overall mean score of 1.40 across the five dimensions of the End-User Computing Satisfaction (EUCS) model: content, accuracy, format, ease of use, and timeliness. Statistical testing revealed a positive and significant relationship between data duplication and circulation services, with a correlation coefficient of 0.304 and a significance value of 0.002. Simple linear regression produced a coefficient of 0.520, with the same significance value. The coefficient of determination of 9.2% indicates that data duplication explains only a limited proportion of the variation in circulation services, while the remaining 90.8% is associated with factors beyond the research model. These findings address the research objectives by identifying the conditions of both variables and establishing their statistically significant relationship. This study contributes empirical evidence on the relevance of data management to circulation services in a regional library context. In practical terms, the findings provide a basis for evaluating transaction recording, data integration, and information updates. The institution should strengthen system synchronization, establish clear operating procedures, improve staff competencies, and conduct regular data audits. Further research should examine other factors, including staff competence, information technology infrastructure, and service procedures, using broader respondent coverage and additional variables to develop a more comprehensive understanding of circulation service performance.

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