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WEB-BASED CULTURAL DOCUMENT ARCHIVING SYSTEM USING CHRONOLOGICAL FILING AT DISDIKBUD CILEGON

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Abstract— *The Department of Education and Culture of Cilegon City continues to encounter challenges in managing cultural archives because document storage and retrieval processes are still performed manually. This condition results in prolonged document retrieval times and increases the risk of losing historical records. This study focuses on implementing the Chronological Filing method in the development of a web-based cultural document archiving system to support the structured management of cultural data and the chronological documentation of cultural development. Using the Waterfall model as the system development methodology, the proposed system applies chronological document classification based on temporal sequences to facilitate document retrieval and the tracking of cultural data histories. System evaluation was conducted using the System Usability Scale (SUS), User Acceptance Testing (UAT), and document retrieval efficiency measurements. The results demonstrate that the proposed system improved document retrieval efficiency by 96.52%, reducing the average retrieval time from 46 minutes to 1.6 minutes. Furthermore, the SUS evaluation yielded a score of 82.25, which falls within the Excellent category. These findings indicate that the developed system effectively enhances cultural archive management while supporting faster and more structured preparation of cultural reports.*

Keywords: *Archiving, Chronological Filing System, Cultural Data Management, System Usability Scale, Waterfall.*

Intisari— *Dinas Pendidikan dan Kebudayaan Kota Cilegon masih menghadapi kendala dalam pengelolaan arsip kebudayaan karena proses penyimpanan dan pencarian dokumen dilakukan secara manual. Kondisi tersebut menyebabkan proses temu balik dokumen memerlukan waktu yang lama serta meningkatkan risiko kehilangan data historis. Penelitian ini berfokus pada implementasi metode Chronological Filing dalam pengembangan sistem pengarsipan dokumen kebudayaan berbasis web untuk mendukung pengelolaan data dan kronologi perkembangan budaya secara terstruktur. Dengan menggunakan model Waterfall sebagai metode pengembangan sistem, sistem ini menerapkan pengelompokan dokumen berdasarkan urutan waktu untuk mempermudah proses pencarian serta pelacakan riwayat data kebudayaan. Pengujian dilakukan menggunakan System Usability Scale (SUS), User Acceptance Test (UAT), serta pengukuran efisiensi waktu pencarian dokumen. Hasil penelitian menunjukkan bahwa sistem mampu meningkatkan efisiensi waktu pencarian sebesar 96,52%, dengan rata-rata waktu temu balik berkurang dari 46 menit menjadi 1,6 menit. Selain itu, hasil pengujian SUS memperoleh skor 82,25 yang termasuk kategori Excellent. Hasil tersebut menunjukkan bahwa sistem yang dikembangkan*

dapat meningkatkan efektivitas pengelolaan arsip kebudayaan serta mendukung penyusunan laporan kebudayaan secara lebih cepat dan terstruktur.

***Kata Kunci**: Pengarsipan, Sistem Pengarsipan Kronologis, Manajemen Data Budaya, Skala Kegunaan Sistem, Waterfall.*

INTRODUCTION

Culture is a strategic asset that reflects the identity, values, and historical continuity of a society. In Indonesia, cultural preservation and advancement are essential components of national development, as mandated by Law No. 5 of 2017 on Cultural Advancement. Along with the rapid development of information technology, government institutions are required to manage cultural data and information effectively to support preservation, decision-making, policy formulation, and cultural development programs (Nurazza et al., 2025).

Therefore, digital cultural archive management is increasingly important to ensure that cultural information remains accessible, reliable, and systematically documented. Recent studies have also emphasized that digital technologies can improve the accessibility, organization, and management of cultural heritage information by integrating diverse cultural resources into structured digital environments (Martins et al., 2023; Huang et al., 2023).

Cilegon City has diverse cultural advancement objects, including traditions, performing arts, cultural heritage sites, and other cultural assets that require continuous documentation. The management of these data and supporting documents is the responsibility of the Department of Education and Culture of Cilegon City. However, based on field observations, cultural document management has predominantly relied on physical storage and conventional record-keeping practices.

These conditions can make document retrieval time-consuming, increase the risk of document loss or damage, and complicate the tracking of the historical development of cultural objects required for documentation and reporting activities (Suryaningsih et al., 2023). Digital archive systems have increasingly been applied to address similar challenges by providing structured storage and facilitating access to cultural heritage information. For example, Batjargal et al. (2023) developed a multimodal digital archive for Borobudur cultural heritage that enables cultural assets and related information to be stored, accessed, viewed, and retrieved systematically.

The need for systematic cultural archive management is further emphasized by the implementation of Data Pokok Kebudayaan (DAPOBUD) as Indonesia's national cultural database. DAPOBUD integrates cultural data from regional institutions; consequently, the quality of national cultural data depends on the completeness and reliability of data managed at the regional level. Previous research has indicated that incomplete supporting documents and ineffective archival practices can hinder the provision of accurate and integrated cultural data (Apriani et al., 2025).

This condition indicates the need for a regional archival system that can organize cultural documents systematically while supporting validation, historical documentation, retrieval, and reporting requirements. In the context of Indonesian cultural heritage, the development of a digital repository has also been demonstrated as a means of improving the management and integration of cultural heritage information, although challenges related to data integration and standardized implementation remain (Hendrawan et al., 2025).

Previous studies have demonstrated the effectiveness of the Chronological Filing method in improving document organization and retrieval. Zamasi and Ekadiansyah (2024) applied the method in a logistics company. Similarly, Setyawan (2024) and Suryaningsih et al. (2023) showed that chronological classification can improve the effectiveness of organizational archive management. However, these studies primarily addressed administrative, correspondence, logistics, and operational records.

Cultural archives have different characteristics because they document the historical development of cultural objects, require supporting-document validation, and are associated with cultural data reporting. Thus, the application of Chronological Filing to cultural archives requires an adaptation that goes beyond simply ordering documents chronologically.

Furthermore, previous studies have generally focused on system implementation and functional testing, with limited integration of usability, user acceptance, and quantitative retrieval-efficiency evaluation within a single cultural archive management context. This creates a research gap concerning how a chronology-based archiving approach can be adapted to manage the historical development of cultural objects while simultaneously supporting document validation, DAPOBUD-related reporting, and comprehensive system evaluation.

This gap is also relevant to broader digital cultural heritage research, where fragmented information, limited integration, and difficulties in

accessing and utilizing cultural heritage resources remain important challenges (Huang et al., 2023). Regional digital heritage initiatives have similarly highlighted the importance of digital infrastructures that support the organization, accessibility, and interoperability of cultural heritage collections (Ziku et al., 2024).

To address this gap, this study develops a web-based cultural document archiving system using the Chronological Filing method. The system integrates cultural object registration, digital document management, document validation, chronological tracking of cultural object development, document retrieval, and report generation to support DAPOBUD reporting requirements.

The system is evaluated through Black Box Testing, User Acceptance Testing (UAT), the System Usability Scale (SUS), and quantitative measurement of document retrieval efficiency. These evaluations assess the system from complementary perspectives, including functional correctness, usability, user acceptance, and retrieval efficiency. The integration of structured digital archiving and retrieval functions is consistent with previous digital cultural heritage research, which emphasizes the importance of organizing cultural information in digital systems to facilitate access, management, and reuse (Martins et al., 2023; Batjargal et al., 2023).

The novelty of this study lies in adapting Chronological Filing from conventional administrative archiving to cultural archive management. This novelty is reflected in three main contributions:

1. Contextualized Archival Chronology: Extends Chronological Filing from conventional document ordering to the systematic recording and tracking of the historical development of individual cultural objects through dedicated chronological records.
2. Integrated Validation and Historical Tracking: Integrates cultural object management, supporting-document validation, historical record management, and reporting functions within a unified archival workflow designed to support DAPOBUD requirements.
3. Comprehensive Empirical Evaluation: Combines Black Box Testing, System Usability Scale (SUS), User Acceptance Testing (UAT), and quantitative pre- and post-implementation measurements of document retrieval efficiency to evaluate the developed system from functional, usability, acceptance, and operational perspectives.

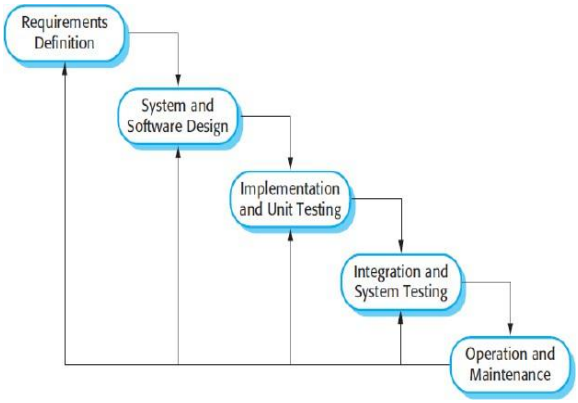
From a scientific perspective, this study contributes to the fields of Information Systems and Digital Records Management by demonstrating how Chronological Filing can be adapted to support the traceability and systematic documentation of continuously evolving cultural records. The study also provides an integrated empirical evaluation approach that combines functional testing, usability assessment, user acceptance evaluation, and retrieval-efficiency measurement. From a practical E-Government perspective, the developed system provides the Department of Education and Culture of Cilegon City with a structured digital framework for managing cultural objects and supporting documents, facilitating historical tracking and validation, improving document retrieval, and supporting the provision of cultural data for DAPOBUD reporting.

Based on these considerations, this study aims to develop and evaluate a web-based cultural document archiving system using the Chronological Filing method to improve the effectiveness of cultural archive management, facilitate chronological documentation and validation of cultural objects, accelerate document retrieval, and support the provision of cultural data for DAPOBUD reporting.

MATERIALS AND METHODS

This study employed applied research to develop and evaluate a web-based cultural document archiving system that supports cultural data management at the Department of Education and Culture of Cilegon City. The research was conducted through a series of stages, including requirement analysis, system design, implementation, integration and testing, and operation and maintenance. These stages were carried out systematically to ensure that the developed system addressed the identified archival problems and user requirements.

The system was developed using the Waterfall model because the main system requirements had been identified during the initial stage of the study and the development scope was relatively stable. The Waterfall model is a sequential software development approach consisting of requirements analysis, system design, implementation, testing, and maintenance, in which each phase is completed systematically before proceeding to the next (Budiman et al., 2024). In this study, the Chronological Filing method was incorporated as the core archival management approach to support document storage, validation, retrieval, and historical tracking of cultural objects. Figure 1 illustrates the system development process based on the Waterfall model.



Source: (Budiman et al., 2024)

Figure 1. Waterfall Model

Requirement Analysis

The Requirement Analysis phase was conducted to identify system requirements based on the existing cultural document archiving practices at the Department of Education and Culture of Cilegon City. Requirement elicitation was carried out through observations of the existing archiving business processes, interviews with personnel responsible for archive management, and a literature review covering digital archiving systems, the Chronological Filing method, and Data Pokok Kebudayaan (DAPOBUD).

The results of this phase consisted of functional and non-functional requirements that served as the foundation for system development. The functional requirements included cultural object registration, digital document management, document validation, historical record management, document retrieval, and report generation. The resulting requirements were used as the basis for developing the Use Case Diagram, Class Diagram, Entity Relationship Diagram (ERD), and the implementation of the web-based system.

System Design

Based on the identified system requirements, the System Design phase encompassed the design of the system architecture, database, user interface (UI), and system modeling using the Unified Modeling Language (UML) and Entity Relationship Diagram (ERD). UML was employed as a standard object-oriented modeling language to represent functional requirements, system structure, and interactions among system components through the Use Case Diagram and Class Diagram (Dennis et al., 2022).

The database was designed using the Entity Relationship Diagram (ERD) to model the relationships among entities involved in cultural archive management, thereby providing a structured data model and facilitating systematic database implementation (Coronel & Morris, 2023). Particular attention was given to the data structure required to maintain the historical development of cultural objects and the validation status of their supporting documents.

The Chronological Filing method was incorporated into the system design as a mechanism for maintaining the chronological history of each cultural object. Each documentation activity or data update related to a cultural object is stored as a separate historical record in the database. This structure enables the system to preserve the sequence of cultural object development over time and allows users to trace previous documentation records systematically. Therefore, the chronological filing mechanism is implemented through dedicated historical records rather than merely through chronological sorting of existing documents.

Implementation

During the Implementation phase, the proposed web-based cultural document archiving system was developed using PHP as the programming language and MySQL as the database management system. The implementation included user authentication, cultural data management, digital PDF document management, document validation, category management, storage location management, historical record management, document retrieval, and report generation. The Chronological Filing method was implemented by associating each cultural document and data update with the corresponding cultural object and storing the resulting information as a separate historical record. Each historical record maintains information regarding the documented development of the cultural object and its chronological position. This enables the system to preserve and retrieve the sequence of changes associated with each cultural object systematically. Consequently, the chronological structure forms an integral part of the archival data model rather than functioning merely as a database sorting operation. The implementation also incorporated a document validation workflow in which supporting documents could be reviewed and validated by authorized personnel before being used for reporting purposes. This workflow was designed to maintain the consistency and reliability of cultural documentation and to support the preparation of data required for DAPOBUD reporting.

Integration and Testing

After all modules had been developed, they were integrated into a unified system. Functional verification was conducted using Black Box Testing to ensure that each system feature operated in accordance with the specified functional

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requirements. The testing covered the main system processes, including authentication, cultural data management, document management, document validation, historical record management, document retrieval, and report generation.
In addition, system usability was evaluated using the System Usability Scale (SUS) to measure users' perceived usability after interacting with the developed system. User Acceptance Testing (UAT) was conducted to assess whether the developed system and its functions were acceptable and appropriate for the intended users.

Furthermore, document retrieval efficiency was quantitatively measured by comparing the document retrieval process before and after the implementation of the proposed system. This measurement was conducted to determine the impact of the developed system and the Chronological Filing method on the efficiency of document retrieval. The combination of Black Box Testing, UAT, SUS, and retrieval-efficiency measurement provided complementary evaluations covering functional correctness, user acceptance, usability, and operational efficiency. In addition, system performance was evaluated by measuring response times for selected core operations, including chronological query processing and digital PDF document rendering, under the operational testing environment.

Operation and Maintenance

The final phase involved deploying the developed system within the operational environment and performing system maintenance based on the testing results and user feedback. Maintenance activities included correcting identified errors, improving system functionality, and adapting the system to operational requirements. These activities were conducted to maintain the reliability, usability, and suitability of the system for continued cultural archive management.

RESULTS AND DISCUSSION

Planning

The planning phase was conducted to identify the system requirements based on the existing problems in cultural archive management at the Department of Education and Culture of Cilegon City. Requirement identification was carried out through observations of the existing archiving process, interviews with personnel from the Cultural Affairs Division, and a literature review on digital archiving systems and the Chronological Filing method. The analysis revealed that archive management was still performed using conventional procedures, resulting in time-consuming processes for document storage, archive retrieval, data validation, and report generation, while also increasing the risk of document duplication and archive loss.

Based on the identified requirements, the proposed system was designed to support integrated cultural archive management by implementing the Chronological Filing method. Specifically, the system was designed to document the historical development of each cultural advancement object chronologically, store supporting documents in digital format, facilitate data validation, accelerate archive retrieval, and generate reports to support Data Pokok Kebudayaan (DAPOBUD) reporting requirements.

The system involves two primary user roles, namely the Administrator and the Officer. The Administrator is granted full access to perform user authentication (Login/Logout), manage storage locations, manage user accounts, manage cultural document records, organize document categories, access validated records, and generate reports. In contrast, the Officer is authorized to review cultural data records, access validation reports, perform document validation, and update document validation status. This role-based access mechanism ensures that archival activities are performed according to the responsibilities assigned to each user, thereby supporting the security, consistency, and validity of archived information. The functional requirements for each user role are summarized as follows.

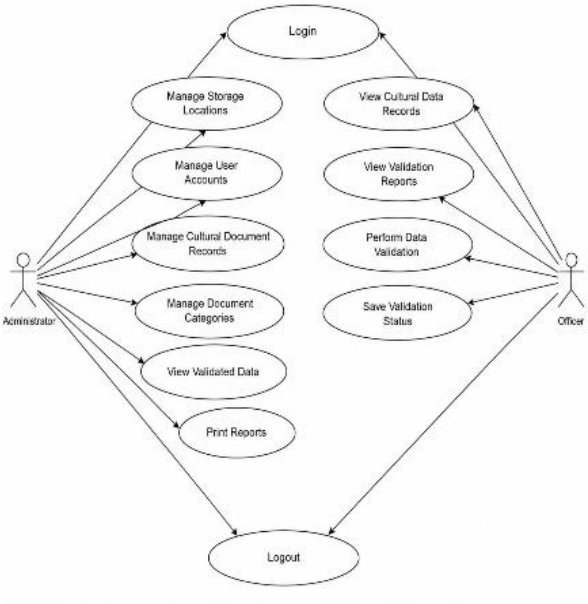
1. Administrator
   a. Authenticate through Login and Logout.
   b. Manage storage locations.
   c. Manage user accounts.
   d. Manage cultural document records.
   e. Manage document categories.
   f. View validated data.
   g. Generate and print reports.

2. Officer
   a. Authenticate through Login and Logout.
   b. View cultural data records.
   c. Access validation reports.
   d. Validate cultural documents.
   e. Update document validation status.

Design

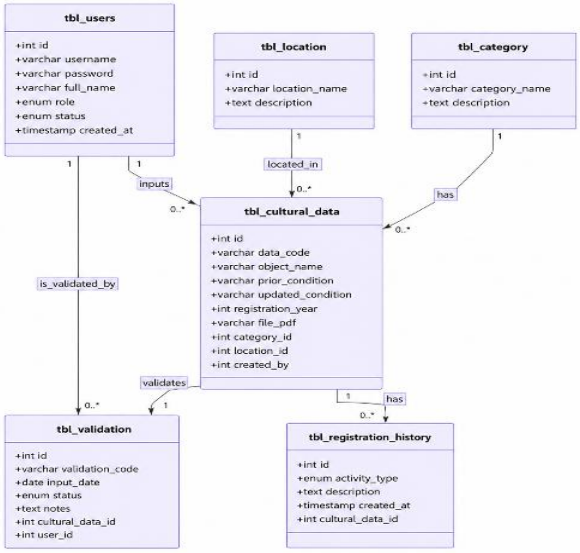
Figure 2 illustrates the functionalities available to each user role within the proposed system. Both the Administrator and the Officer are required to authenticate through the Login interface before accessing the system functionalities. After authentication, users are granted access to features corresponding to their assigned roles, including document management, validation, and reporting.

Upon completing their tasks, users may securely terminate their sessions through the Logout function.



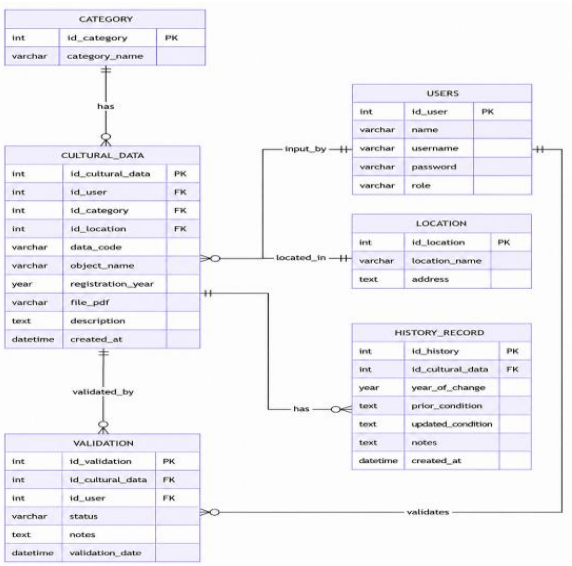
Source: (Research Results, 2026)
Figure 2. Use Case Diagram

Figure 3 presents the Class Diagram, which illustrates the structural design of the system, including the relationships among classes and their corresponding attributes and primary keys. The diagram describes the entities and their interactions that support the cultural document archiving process. The principal entity, tbl_cultural_data, stores information related to cultural objects, including document codes, cultural object names, conditions, registration year, and associated PDF documents.



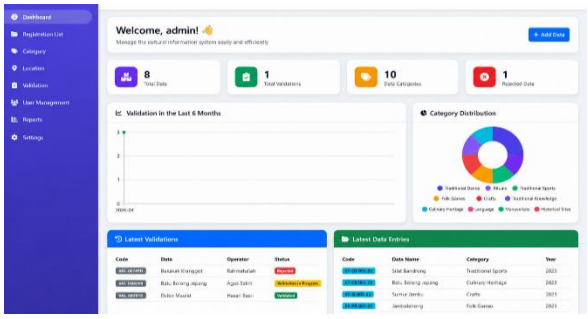
Source: (Research Results, 2026)
Figure 3. Class Diagram

This entity is associated with the master tables tbl_location and tbl_category, which provide references for storage locations and document classification. In addition, the tbl_users entity stores information about system users responsible for archive management. The operational workflow is represented by the tbl_validation entity, which records document verification performed by officers, and the tbl_data_history entity, which stores the chronological history of changes to cultural object records in accordance with the Chronological Filing method.



Source: (Research Results, 2026)
Figure 4. Entity Relationship Diagram (ERD)

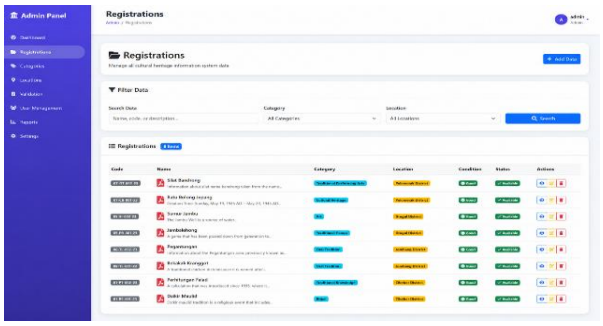
Figure 4 illustrates the Entity Relationship Diagram (ERD) used to model the relationships among entities within the cultural document archiving system. The database design provides a structured data environment in which cultural document records, document categories, storage locations, validation data, user information, and reporting-related data are logically interconnected. The ERD was developed to minimize data redundancy while preserving data integrity before database implementation (Coronel & Morris, 2023).



Source: (Research Results, 2026)
Figure 5. Dashboard

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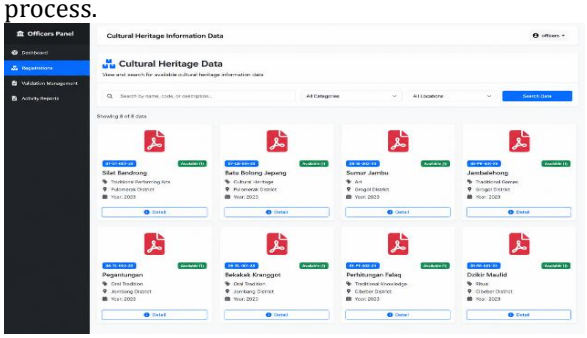
Figure 5 presents the system dashboard, which provides a summary of cultural data, validation activities, and archive management statistics. The dashboard serves as the primary information center, enabling users to monitor the overall status of cultural archive management.



Source: Research Results (2026)

Figure 6. *Cultural Data Management Interface*

Figure 6 illustrates the Cultural Data Management Interface, which represents one of the core functionalities of the proposed system. Through this interface, users can add, update, search, and manage cultural data together with their supporting PDF documents. The centralized storage of digital documents facilitates more systematic document management and retrieval compared with the previous manual archiving process.



Source: Research Results (2026)

Figure 7. Validation Data Collection Interface

Figure 7 illustrates the Validation Data Collection Interface, which supports the document validation process. This feature enables authorized officers to examine and validate uploaded documents before they are used for reporting or data synchronization purposes. The validation mechanism plays a crucial role in maintaining the accuracy, consistency, and reliability of the cultural data stored within the system.

Implementation of the Chronological Filing Method

The Chronological Filing method was implemented by organizing cultural document records according to the chronological sequence of their registration and subsequent management activities. Each registered record is stored together with supporting metadata, including the document code, category, storage location, registration date, digital document (PDF), and validation status. These metadata provide the basis for systematic archive organization, retrieval, and historical tracking. This approach is consistent with digital records management principles that emphasize the role of metadata and temporal information in supporting document organization, management, and retrieval (Budiman et al., 2024).

During implementation, every document entered into the system was automatically recorded together with its registration timestamp, which served as the basis for chronological classification. Documents were subsequently organized according to their temporal sequence, allowing the historical development of each cultural object to be systematically traced. This approach enables users to monitor the complete document management process—from initial data registration and document validation to report generation—while ensuring that the historical information associated with each cultural object remains consistently documented.

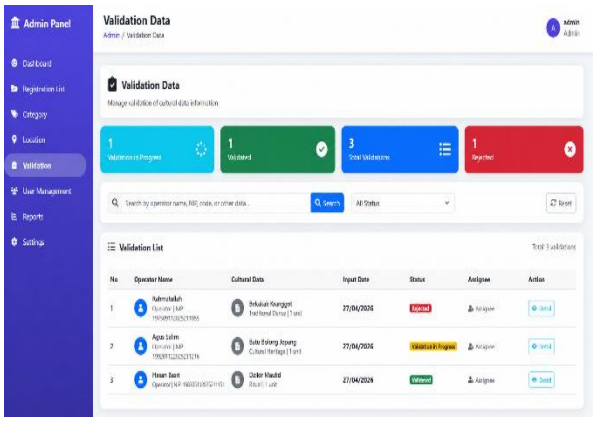
Rather than relying solely on database-level sorting, such as an ORDER BY SQL clause, the Chronological Filing method is incorporated into the system through a structured document indexing scheme and temporal event logging. Each cultural record is assigned a standardized chronological document index using the format [CC]-[LL]-[SSS]-[YY], as illustrated by 07-TT-002-23. The components are defined as follows:

a. CC (Category Code): a two-digit identifier representing the cultural category, (e.g., "07" for Traditional Sports).
b. LL (Location Code): a two-letter abbreviation representing the administrative sub-district, (e.g., "TT" for Pulomerak).
c. SSS (Sequential Order): a three-digit sequential number representing the order of record registration within the corresponding category and location.
d. YY (Year Code): a two-digit representation of the registration year, (e.g., "23" for 2023).

The sequential component provides an ordered identifier for records registered within the same category and location, while the year component identifies the registration period. Thus, the index code provides a standardized reference that combines categorical, spatial, sequential, and temporal information within a single document identifier. Furthermore, historical developments of cultural objects are managed via the tbl_registration_history entity. When updates occur regarding the condition or status of a cultural object,

the system records a new entry containing the prior condition, updated condition, change description, and an exact creation timestamp (created_at) without overwriting historical records. Consequently, the Chronological Filing logic governs both the front-end indexing protocol and the back-end historical evolution tracking architecture.

The Chronological Filing method is also integrated into the document validation process. After a document is uploaded, it proceeds through a validation workflow performed by an authorized Officer. Changes in document validation status, including Pending Validation, Validated, and Rejected, are recorded as part of the document's management history. This mechanism supports document traceability and ensures that the validation status of each archival record can be monitored systematically. Furthermore, the chronological information stored in the system supports document retrieval through search, filtering, and reporting functions based on relevant archival attributes and periods. Users can identify records more systematically by using category, location, chronological index, and registration period as retrieval references. The method therefore supports not only document organization but also historical tracking, validation, status monitoring, and preparation of information required for Data Pokok Kebudayaan (DAPOBUD) reporting. These findings demonstrate that the Chronological Filing method functions not merely as an archival mechanism but also as an integrated and sustainable approach to cultural document management (Budiman et al., 2024).



Source: Research Results (2026)

Figure 8. Document Validation Interface

Figure 8 illustrates the implementation of the Chronological Filing method during the cultural document validation process. Each registered document is displayed together with its registration date and validation status, enabling Officers to monitor archival records chronologically. Status transitions from Pending Validation to Validated or Rejected are recorded as part of the archival history. This chronological information supports document traceability, data consistency, report generation, and document retrieval more effectively than conventional manual archive management.

Testing

Functional testing was conducted using the Black Box Testing method. The results presented in Table 1 demonstrate that all core system functionalities operated in accordance with the predefined functional requirements. User authentication, cultural data management, document validation, report generation, dashboard visualization, and the logout process were successfully executed without any functional errors. These results indicate that the developed system fulfilled the functional requirements identified during the planning phase and that the implemented modules operated according to their specified functions.

Table 1. Black Box Testing Results

No	Function	Expected Result	Test Result
1	Login	The system displays the main page according to the user's access privileges.	Successful
2	Cultural Data Management	Data is stored and displayed in the cultural data list	Successful
3	Edit Cultural Data	The system updates the selected record.	Successful
4	Delete Cultural Data	The selected record is removed from the database.	Successful
5	Search Function	The system displays records matching the specified keywords.	Successful
6	Filter Function	The system displays records based on the selected category or location.	Successful
7	Document Validation	The system stores the validation status and updates the corresponding record.	Successful
8	Reporting Module	The system generates reports based on the selected data.	Successful

No	Function	Expected Result	Test Result
9	Administrator Dashboard	The system displays archive and validation statistics.	Successful
10	Logout	The system terminates the current session and returns to the login page.	Successful

Source: Research Results (2026)

The usability of the proposed system was evaluated using the System Usability Scale (SUS), which is widely recognized as a standard instrument for measuring users' perceived usability. The SUS questionnaire consists of ten statements rated on a five-point Likert scale ranging from Strongly Disagree to Strongly Agree. To ensure respondents clearly understood each statement, the questionnaire employed the validated Indonesian version proposed by Kurniawan et al. (2022). The SUS score was calculated for each respondent based on the standard scoring procedure. As presented in Table 2, the highest SUS score obtained was 100, while the lowest score was 62.5. The most frequently occurring score (mode) was 85, indicating that the majority of respondents evaluated the system within this usability range.

Table 2. SUS Calculation Results Score

Respondent	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Value	SUS Score
R1	3	4	3	4	3	2	3	4	3	4	33	82,5
R2	4	4	4	4	4	3	4	2	4	1	34	85
R3	4	4	4	4	3	3	4	4	4	4	38	95
R4	2	3	3	4	4	3	3	4	3	4	33	82,5
R5	3	3	3	4	3	4	3	3	2	3	31	77,5
R6	4	4	4	3	3	3	3	3	4	3	34	85
R7	4	3	3	4	4	2	4	2	4	3	33	82,5
R8	4	3	4	4	2	2	2	3	3	4	31	77,5
R9	4	2	4	2	4	2	4	2	4	1	29	72,5
R10	3	4	4	4	3	4	4	3	4	3	36	90
R11	3	3	4	3	3	4	4	3	3	4	34	85
R12	4	4	3	3	4	3	3	3	4	3	34	85
R13	2	2	3	3	3	3	3	2	3	3	27	67,5
R14	3	3	3	2	4	3	3	3	4	4	32	80
R15	4	4	4	4	4	4	4	4	4	4	40	100
R16	3	3	3	3	3	3	3	3	3	3	30	75
R17	2	3	3	2	3	3	2	2	2	3	25	62,5
R18	3	4	4	3	3	4	4	4	4	4	37	92,5
R19	4	3	3	3	4	3	3	3	4	3	33	82,5
R20	3	3	4	3	4	3	4	3	4	3	34	85
					Total SUS Score							1645 82,25

Source: Research Results (2026)

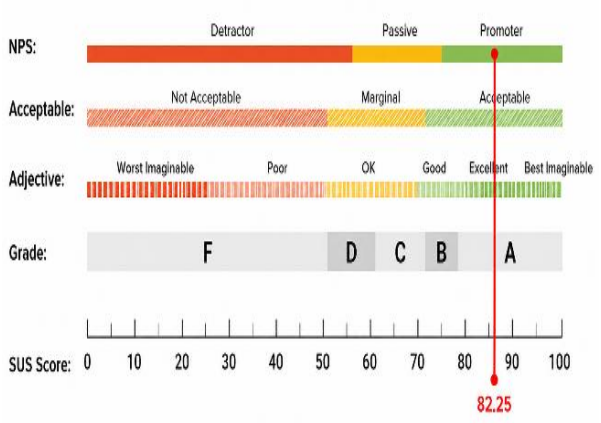
The overall usability score was calculated as the arithmetic mean of the individual System Usability Scale (SUS) scores obtained from all respondents, expressed formally in Equation (1):

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i \quad (1)$$

where $\bar{x}$ represents the average SUS score across all respondents, x_i denotes the total score calculated for each individual respondent i according to Brooke's standard SUS scoring rules, and n is the total number of respondents $n = (20)$. Based on the evaluation data collected from 20 respondents, the sum of all individual SUS scores was 1,645 ($\sum x_i = 1645$). Consequently, the arithmetic mean SUS score for the system is computed in Equation (2):

$$\bar{x} = \frac{1645}{20} = 82{,}25 \quad (2)$$

The resulting mean score of 82.25 was subsequently evaluated against the standard SUS benchmarks proposed by Brooke (1996) and Bangor et al. (2008), placing the system performance within the *"Excellent"* adjective rating category, an *"Acceptable"* range, and achieving a *Grade A* usability classification. The obtained average score was subsequently interpreted using the standard SUS interpretation scale presented in Figure 9.



Source: Research Results (2026)

Figure 9. SUS Interpretation Scale

The usability evaluation indicates that the proposed system achieved an average SUS score of 82.25, placing it in the Excellent category, with an Acceptable level of user acceptance and Grade A performance. These findings demonstrate that the developed system provides a high level of usability, is easy to learn and operate, and delivers a positive user experience. The result suggests that users were able to interact with the system effectively in performing cultural archive management activities.

The high SUS score can be associated with several characteristics of the developed system, including the structured user interface, role-based access separation, and organized document-validation workflow. The separation of Administrator and Officer functions allows users to access features relevant to their responsibilities, while the structured validation workflow provides a clear sequence for reviewing and updating document status. These characteristics may reduce the cognitive effort required to perform routine archival tasks and contribute to the system's high perceived usability.

User acceptance was evaluated using User Acceptance Testing (UAT). The results presented in Table 3 indicate that all tested system modules were accepted by the users. The acceptance results demonstrate that the developed system meets the operational requirements identified during the planning phase and can support the main cultural archive management activities at the Department of Education and Culture of Cilegon City.

Table 3. User Acceptance Testing Results

Module	Result
Login	Accepted
User Management	Accepted
Cultural Data Entry	Accepted
Validation Process	Accepted
Reporting Module	Accepted

Source: Research Results (2026)

The principal efficiency finding is presented in Table 4, which compares document retrieval performance before and after implementation of the proposed system. Before implementation, document retrieval was performed manually and required an average of 46 minutes. After implementation of the web-based cultural document archiving system using the Chronological Filing method, the average retrieval time decreased to 1.6 minutes. The improvement in retrieval efficiency was calculated based on the reduction in average retrieval time:

$$Efficiency\ Improvement = \frac{T_{before} - T_{after}}{T_{Before}} \times 100\% \quad (3)$$

Where Tbefore represents the average retrieval time before implementation and Tafter represents the average retrieval time after implementation.

$$\frac{46 - 1{,}6}{1{,}6} \times 100\% = 96{,}52\%$$

Therefore, the implementation of the proposed system resulted in a 96.52% reduction in average document retrieval time.

Table 4. Archive Retrieval Efficiency Analysis

No	Cultural Document Type	Pre-Test Time (Manual)	Post-Test Time (System)	Time Difference
1	Silat Bandrong	45 Minutes	1.5 Minutes	43.5 Minutes
2	Batu Bolong Jepang	60 Minutes	2 Minutes	58 Minutes
3	Pegantungan	35 Minutes	1 Minutes	34 Minutes
4	Jambalehong	50 Minutes	2.5 Minutes	47.5 Minutes
5	Dzikir Mulud	40 Minutes	1 Minutes	39 Minutes
	Average	46 Minutes	1.6 Minutes	44.4 Minutes

Source: Research Results (2026)

The substantial reduction in retrieval time can be associated with the transition from manual physical archive searching to centralized digital retrieval. In the previous process, users had to locate physical documents through conventional storage procedures. In the developed system, documents can be searched and filtered using structured metadata, including category, location, registration period, and chronological document index. The chronological indexing scheme further

provides a standardized reference for identifying records, while digital PDF storage eliminates the need to physically locate individual documents. These mechanisms reduce the number of manual search steps required to identify and access a document and consequently contribute to the observed reduction in retrieval time.

The result is consistent with previous studies by Zamasi and Ekadiansyah (2024) and Suryaningsih et al. (2023), which reported that chronological organization can improve archive management and facilitate document retrieval. However, the present study extends this approach to cultural archives by combining chronological organization with historical tracking, document validation, and digital document management. The Black Box Testing results were analyzed descriptively by comparing the observed system behavior with the predefined functional specifications. The UAT results were evaluated based on the acceptance status of each system module, while the SUS scores were calculated according to the procedure proposed by Brooke (1996). Furthermore, system efficiency was assessed by comparing the average document retrieval time before and after system implementation.

Unlike previous studies, which primarily applied the Chronological Filing method to administrative records and organizational documents, the present study implemented the method within the domain of cultural archive management, where historical value and continuously evolving information represent essential characteristics. Consequently, the proposed system not only improves operational efficiency but also supports the preservation of cultural heritage information and facilitates the provision of reliable data required for Data Pokok Kebudayaan (DAPOBUD) reporting.

System Performance Evaluation

In addition to functional, usability, acceptance, and retrieval-efficiency evaluation, system performance was assessed by measuring response times during core system operations. The test results indicated that chronological query processing required an average response time of 0.24 seconds, while digital PDF document rendering required an average of 1.1 seconds under standard local network conditions. These results indicate that the PHP/MySQL-based system provided responsive performance for the tested archival operations within the study environment. The relatively short response times support the practical use of the system for routine document search and access activities. However, these performance results should be interpreted within the scope of the testing environment. The evaluation was conducted under the available local network and archive conditions and therefore does not establish system performance under substantially larger archive volumes or concurrent user loads.

Deep-Dive Discussion on Evaluation Findings

The overall evaluation results indicate that the developed system successfully addressed the primary problems identified during the planning phase. Black Box Testing confirmed that the core functionalities operated according to their specifications, while UAT indicated that the implemented modules were accepted by users. The SUS score of 82.25 indicates a high level of perceived usability, and the reduction in average retrieval time from 46 minutes to 1.6 minutes demonstrates a substantial improvement in document retrieval efficiency.

The findings also have implications for cultural archive management. By integrating digital document storage, chronological indexing, historical tracking, and document validation, the system provides a more structured mechanism for maintaining the continuity and traceability of cultural records. This is particularly relevant for cultural objects whose conditions and supporting documentation may change over time. In addition, the availability of validated digital records can support the preparation of cultural information required for DAPOBUD reporting.

Unlike previous studies that primarily applied Chronological Filing to administrative, correspondence, logistics, and organizational records, this study demonstrates its applicability to cultural archives, where historical development, document validation, and continuity of information are important considerations. The findings therefore provide empirical support for adapting chronology-based archival methods to a cultural information-management context.

Study Limitations

Although the developed system demonstrated positive results in terms of functionality, usability, user acceptance, and document retrieval efficiency, several limitations should be acknowledged.

1. Evaluation Sample Size: The usability and user acceptance evaluations were conducted with 20 respondents. Although this number was sufficient for the evaluation conducted in this study, the relatively limited sample size may not fully represent the diversity of potential users in other government institutions or cultural archive environments.
2. Institutional Scope: The system was implemented and evaluated at the Department

of Education and Culture of Cilegon City. Therefore, the findings may not be directly generalizable to other government institutions with different organizational structures, archival procedures, or cultural data management requirements.

3. Lack of Direct DAPOBUD Integration: The current system does not yet provide direct real-time integration with the national DAPOBUD platform through an API. Cultural data and supporting documents are currently prepared through the reporting functions provided by the system rather than synchronized automatically with the national database.
4. Archive Volume and Scalability: System performance was evaluated under the operational conditions available during the study. The system has not yet been evaluated through large-scale load and stress testing involving substantially larger archive volumes and concurrent users. Therefore, the scalability and performance of the system under high-load conditions require further investigation.
5. Security Evaluation: The evaluation focused primarily on functionality, usability, user acceptance, retrieval efficiency, and response time. A comprehensive security assessment, including vulnerability testing and penetration testing, was not conducted in this study.

CONCLUSION

This study successfully developed a web-based cultural document archiving system using the Chronological Filing method at the Department of Education and Culture of Cilegon City to address limitations in the previous manual processes for document storage, validation, and retrieval. The implementation of the Chronological Filing method enables cultural document records to be organized using structured chronological identifiers and historical records, allowing the development of individual cultural objects to be systematically documented and traced over time. The evaluation results demonstrate that the developed system satisfies the functional, usability, and user acceptance requirements.

Black Box Testing confirmed that the tested system functionalities operated according to their specified requirements, while User Acceptance Testing (UAT) indicated that the implemented modules were accepted by users. The System Usability Scale (SUS) evaluation produced an average score of 82.25, which falls within the Excellent adjective-rating category and Acceptable range, corresponding to a Grade A classification. The result indicates a high level of perceived usability among the evaluated users. The principal contribution of this study lies in adapting the Chronological Filing method from conventional administrative archiving to cultural archive management.

The proposed approach integrates cultural object registration, digital document management, document validation, chronological historical tracking, document retrieval, and reporting within a unified web-based system. The system reduced average document retrieval time from 46 minutes to 1.6 minutes, corresponding to a 96.52% improvement in retrieval efficiency. These findings provide empirical evidence of the practical effectiveness of the proposed approach in supporting more structured and efficient cultural archive management. Despite these contributions, the study remains limited by the relatively small evaluation sample, implementation at a single government institution, the absence of direct real-time DAPOBUD API integration, and the limited scope of large-scale performance and security testing.

These limitations provide opportunities for further development and validation of the proposed system. To build upon these findings, future research should focus on four key technical directions: (1) developing RESTful API integration for direct, real-time bidirectional synchronization with the national DAPOBUD platform, (2) incorporating Artificial Intelligence (AI) and Optical Character Recognition (OCR) techniques for automated archive metadata extraction and document indexing, (3) implementing semantic search algorithms to facilitate document retrieval based on historical context, and (4) designing an interactive analytical dashboard to provide municipal decision-makers with visual trend insights for regional cultural preservation policy formulation.

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