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Research Article

Design and Implementation of a MongoDB-Based Digital Archiving System for Government Office Record: A Case Study of Kelekar District Office.

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Abstract
The Kelekar District Office faces the inefficiency of manual archive management and the limitations of relational databases in handling dynamic document metadata variations. This study aims to design a digital archiving software based on a Non-Relational Database (NoSQL) to overcome the rigidity of conventional data storage structures. The system development method uses a Prototyping model that includes communication stages, rapid planning, design modeling, prototype construction, and handover to users. The system is built using the Laravel framework integrated with MongoDB as a JSON/BSON-based document storage medium. The result of this study is a digital archive application design that applies the schema-less concept. As a result, the implementation of a NoSQL database using MongoDB has proven effective in handling the characteristics of heterogeneous government archive data. The schema-less concept in MongoDB allows the system to store various document metadata variations in a single flexible collection without the limitations of a rigid table structure. The implementation of full-text search technology and a Single Page Application-based application architecture (using Laravel Livewire) has significantly improved the efficiency of document search time. Employees can search for old archives based on specific keywords or dynamic metadata parameters with low latency compared to manual search methods.

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Introduction

Advances in information technology have significantly shifted the paradigm of data management in government agencies. The transformation to e-government is now a strategic necessity to improve efficiency, accountability, and the quality of public services (Cahyono et al., 2023). Digitalization enables the conversion of physical processes into integrated digital systems, thereby improving efficiency, accessibility, and data accuracy (Vial, 2019). Archives play a crucial role in supporting organizational accountability, transparency, and decision-making processes (Widiyawati et al., 2023). Effective archive management reflects the quality of organizational governance and administrative performance (Dikopoulou & Mihiotis, 2012; Mohammad et al., 2024; Rokhman et al., 2024). One administrative activity significantly influenced by technological development is archive management. Through the utilization of information technology, archival processes can shift from conventional manual storage to structured digital systems that facilitate storage, retrieval, exchange, and strategic use of information (Koderi et al., 2023; Ranosa et al., 2026).

In governmental institutions, archives serve not only as documentation records but also as legal and administrative evidence that supports bureaucratic functions and policy formulation (Fathurrahman, 2018). Therefore, systematic and technology-based archival management is essential to prevent document loss, duplication, and mismanagement (Serour et al., 2026; Tella et al., 2022). Digital archives are documents stored and processed in binary code, allowing them to be transmitted, created, opened, and deleted using computing devices capable of reading and processing binary-based data (Alqahtani et al., 2021; Farahzadi et al., 2022; Lombardi et al., 2021). This format allows archives to be used, accessed, and utilized more flexibly. NoSQL was designed to address the limitations of RDBMSs in handling large data volumes (big data), horizontal scalability, and heterogeneous data structures. The main characteristic of NoSQL is that it is schema-less, allowing data to be stored without the need to define a rigid table structure beforehand (Agustín Tortolero Osuna & Jorge Rosales Silva, 2019; Bansal et al., 2024). This differs from SQL, which requires strict normalization. Using NoSQL databases offers high flexibility in accommodating changes to document metadata attributes (Arshad et al., 2023; Khan et al., 2023).

Bueskens (2020) mentioned that MongoDB is one of the most popular NoSQL databases with a document-oriented model (Document-Store). Data in MongoDB is stored in BSON (Binary JSON) format, a binary representation of JSON documents. The storage hierarchy in MongoDB consists of a database, a Collection, and a Document (equivalent to a row/record in SQL), which consists of key-value pairs (Carter, 2024a, 2024b; Li et al., 2025). The main advantages of MongoDB utilized in this research are its fast document indexing capabilities and horizontal scalability (sharding) features, which ensure it is capable of handling the long-term growth of sub-district archives.

Several studies have examined the implementation of digital archival systems in different institutional contexts. Research by Caroline developed a Dynamic Archival Information System (SIKD) at the Grobogan Regional Archives and Library Office to manage and digitize dynamic archives. However, its implementation faced limitations due to insufficient human resources and unstable internet connectivity (Bhattacharyya et al., 2020; Ntorukiri et al., 2022). Martinez-Mosquera et al. (2020) in their research Implementation of NoSQL MongoDB in Library Information Systems, Prototype / MongoDB method, Library systems become faster in searching for books, but government archives have more complex metadata than books. Research by (Muhidin et al., n.d.), entitled Relational Database Migration to NoSQL for Academic Data, Experimental / MongoDB method, Proves MongoDB read performance is 30% faster than MySQL. However, the study only focused on building a new system (from scratch), not migrating old data. However, the results of the study show more efficient MongoDB performance. The results of (Putra et al., n.d.), Web-Based E-Archives Using MySQL, which uses the Waterfall / MySQL method, is a standard archiving system. The study still uses rigid SQL, while the study that the author conducted applies Full NoSQL for metadata flexibility.

Siwu implemented ane-archive information system in schools for managing certificates and student grades, yet the system did not comprehensively document broader student activities (Siwu et al., 2023). Oyama developed a university-based e-archives website that improved storage efficiencyand archive security while simplifying retrieval processes (Oyama et al., 2021). Similarly, Kusumawardhani implemented a dynamic archival information system in vocational schools, although response delays occurred due to the workload of structural officers (Kusumawardhani et al., 2023).

Obstacles to archive management were also found at the Kelekar District Office, the research object. Based on initial observations, the current archiving system is not yet optimally integrated. Management of important documents, such as correspondence, population data, and permit archives, still faces issues of data redundancy, retrieval difficulties, and inconsistent storage of digital files scattered across various devices. This condition impacts the slowness of public services and the risk of loss of integrity of sub-district administrative data.

The main challenge in developing an archive digitization system in Kelekar District lies in the heterogeneous nature of archival data. Each type of document (Decree, ID Card, Cover Letter, Report File) has different metadata attributes and frequently changes its format according to regulations. In the relational database management system (RDBMS) approach, the data structure is designed very neatly with a fixed schema (rigid schema). Although RDBMS is very reliable for consistent transactional data, its application to archival data with a dynamic structure requires quite complex table normalization and more effort in schema maintenance when new document attribute types are added.

Method

The research was conducted at the Kelekar District Office on Jalan AMD Manunggal IV, Teluk Jaya Village, Kelekar District, Muara Enim Regency, South Sumatra. This location was selected based on information from the local sub-district head that the agency was still experiencing obstacles in managing archives that had not been digitally integrated. The research period was two months, from February 6 to April 6, 2024. To obtain accurate data and information in compiling this research, the author used data collection techniques through observation and in-depth interviews with Desi Astati, SE., Head of the General Affairs Sub-Division, as the source. The interviews aimed to explore the functional needs of the system, with a primary focus on identifying the variety of documents managed.

The research method used in this final project is applied research. This research focuses on solving practical problems faced by the Kelekar District Office, specifically related to the inefficiency of manual archive management, through the design and development of digital archiving software.

The approach used in this research is both descriptive and constructive (Jones et al., 2022; Martinez-Mosquera et al., 2020). The descriptive approach is used to describe the current system conditions and analyze existing problems, while the constructive approach is used to develop a technical solution in the form of a Non-Relational Database (NoSQL)-based information system. This solution is designed to overcome the limitations of conventional systems in handling the flexibility and volume of archive data.

Method Of Collecting Data is; (1) Observation, the author conducted direct observations at the Kelekar District Office to analyze the current archives management workflow. The focus of the observations included: Physical Document Flow; Observing the journey of letters from the reception desk, through the recording process in manual diaries, and distribution to the leadership desks (Camat/Sekcam) for disposition; Storage Conditions; Observing the volume of physical files stacked in filing cabinets, the risk of document damage due to environmental factors (dampness/termites), and the time-consuming retrieval of old documents by staff; and Process Inefficiency; Recording duplication of work, where staff must record the same data in the incoming mail logbook and disposition sheet manually. (2) Interview. The author conducted a face-to-face, in-depth interview with an authorized source, namely Desi Astati, SE., Head of the General Affairs Sub-Division. The

interview aimed to explore the system's functional requirements, with a primary focus on identifying the variety of documents managed, including: Identification of Document Variations (Reasons for Using NoSQL); Routine Official Letters: Such as Incoming/Outgoing Letters that have standard attributes (Letter Number, Subject, Date); Legal Products (SK): Decrees that have a specific data structure such as considerations (Considering, Considering, Deciding) and validity periods.; Citizen Service Files: Recommendation documents (e.g., Business Permit Recommendations, Crowd Permits, Certificates of Poverty) that require the recording of specific citizen data (NIK, Business Type, Location); Task Order Letters (SPT): Documents containing a list of employee names (data array) assigned to external services; and Main Obstacle: Digging up information related to the frequent delays in dispositions due to leaders being on official business, as well as the risk of losing physical disposition sheets.

The system development method applied in this research is the Prototyping model. According to Pressman (Pressman, 2010), prototyping is an iterative software development approach, in which developers create an initial working model (prototype) of the system for user evaluation to clarify specific needs that were not well defined at the beginning of the project

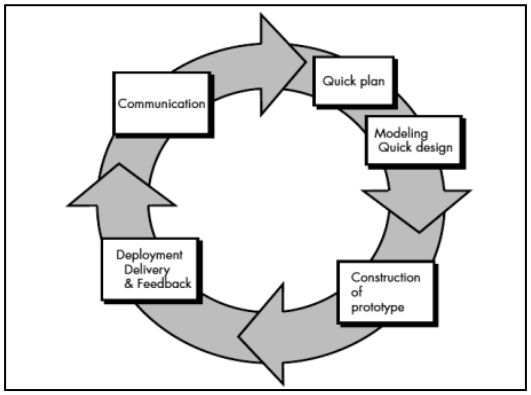

Figure 1. *Prototyping Methods* (Pressman, 2010)

. The development process began with an initial needs assessment involving communication with the Kelekar District Office. This stage aimed to identify the fundamental system requirements, including the types of official letters to be archived, existing archival procedures, and constraints encountered in data retrieval. Based on the information obtained, the researchers formulated a rapid modelling plan that prioritized two main system features: a hybrid data storage structure, which separates relational and non-relational data using SQL and NoSQL databases, and a document upload mechanism to support digital archive management.

Following the needs assessment, the researchers developed a system mock-up and preliminary database schema. This stage focused on designing user-oriented visual representations, including archive input forms, document upload interfaces, and search result displays. The approved design was then translated into a functional prototype using the Laravel framework. During this implementation stage, several core features were developed, including the integration of Laravel with MongoDB, the configuration of data storage mechanisms, and the construction of basic archive management functions. These components enabled the prototype to be operated and evaluated in a real-use context.

The prototype was subsequently delivered to the sub-district staff for user testing. The testing process focused on assessing system usability, accessibility, document retrieval speed, and the

relevance of the developed features to administrative needs. Feedback from users was collected and used as the basis for system refinement in subsequent development iterations. This iterative process allowed the researchers to improve the prototype progressively until the system met the functional requirements and user expectations of the Kelekar District Office.

Result and Discussion

Result

Based on the findings of document variations during the communication phase, the author developed a strategic plan to implement a Non-Relational (NoSQL) database solution to replace rigid table structures. The work plan focused on designing the data architecture and core features, including: (1) Dynamic Schema Design: Planning a single collection structure in MongoDB that utilizes the dynamic_meta feature to accommodate attribute differences between Decrees, Assignment Letters, and Regular Letters without the need for complex table normalization. (2) Functional Feature Prioritization: Establishing an initial development focus on the Archive Upload module with an input form that adapts to letter category, as well as a Quick Search module to address the issue of slow retrieval of physical archives. And (3) Technology Selection: Establishing the use of the Laravel 12 Framework in combination with the laravel-mongodb driver to expedite the process of executing the plan into program code.

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Modeling Quick Design translating previously analyzed system requirements into a more technical software design representation before entering the coding phase. Activities carried out include : (1) NoSQL Data Structure Design: The author designed a document collection schema for MongoDB. The design focused on creating a dynamic_meta structure to accommodate various archive attributes without complex table normalization. And (2) User Interface Design: The author created a low-fidelity mockup using Balsamiq Wireframes. Balsamiq was chosen to accelerate the visualization of the dynamic upload form layout and disposition flow, allowing for immediate evaluation of the interface logic without being distracted by detailed graphical design aspects.

The design was quickly translated into PHP using the Laravel 12 framework. At this stage, the author configured a connection to the MongoDB database using the laravel-mongodb library. The main focus was on building functional features such as data storage dynamic metadata and archive file management to enable the system to be run and tested.

The prototype system was submitted to users (sub-district employees) for testing. Users provided feedback regarding ease of use and data search accuracy. The authors then analyzed this

feedback as a basis for improvements in subsequent development iterations until the system was declared ready and met operational needs;

Login Page, serves as the system's main security gateway. Users are required to enter their registered email address and password. The system implements authentication validation and password encryption to prevent unauthorized access. If the login is successful, the user will be redirected to the Dashboard, depending on their access rights (Admin or Staff).

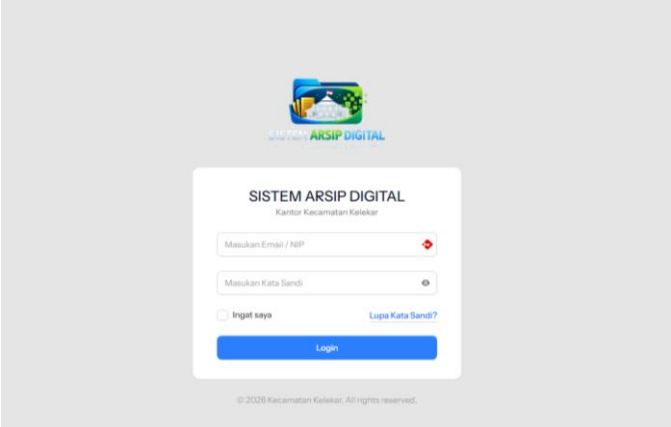

Figure 2. Login Page

Dashboard Admin, presents a real-time summary of archive statistics. Admins can view widgets showing the number of incoming and outgoing mail, active dispositions, and registered users. A monthly archive data visualization chart is also displayed to facilitate document volume monitoring at the Kelekar District Office.

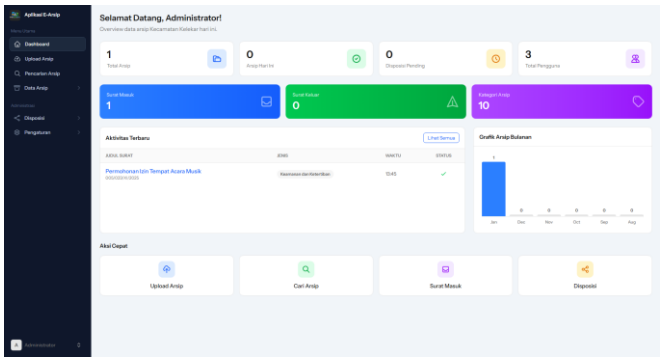

Figure 3. Dashboard Admin

This feature is a key implementation of NoSQL flexibility. This page provides a dynamic form whose input fields automatically change based on the selected archive category (e.g., the NIK input appears only in the Services category). Users can also upload physical archive files in PDF format on this page.

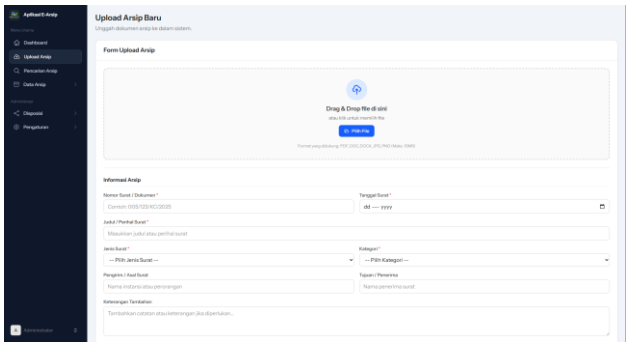

Figure 4. Upload New Archive

A global search module allows users to browse the entire document collection. This feature, powered by MongoDB indexing, enables keyword searches based on letter numbers, subject lines, and dynamic metadata with fast response times (low latency).

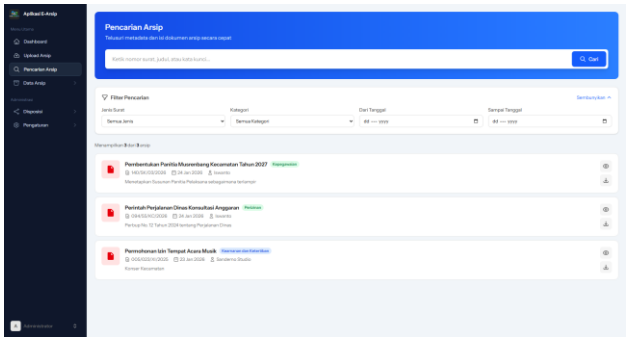

Figure 5. Archive Search

Archive Detail, displays comprehensive information about an archived document. The left side displays metadata (letter attributes) in a structured manner, while the right side provides a live preview of the PDF document (embedded viewer), allowing users to read the contents of the letter without having to download it first.

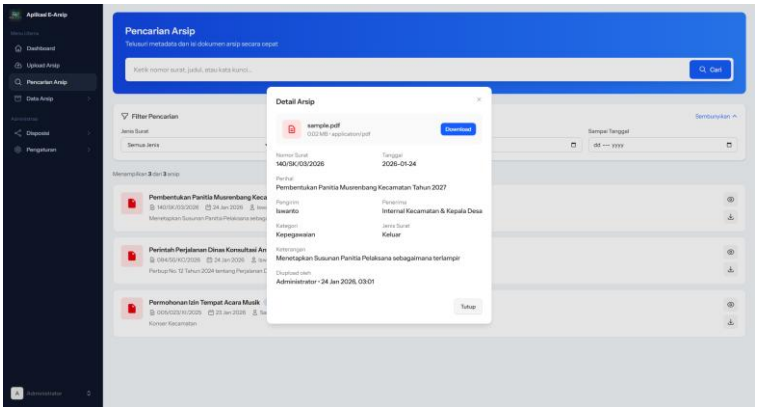

Figure 6. Archive Detail

Incoming Mail Archive Data, displays a tabular list of all digitized incoming mail. The table features pagination, date sorting, and status filters to facilitate daily archive management.

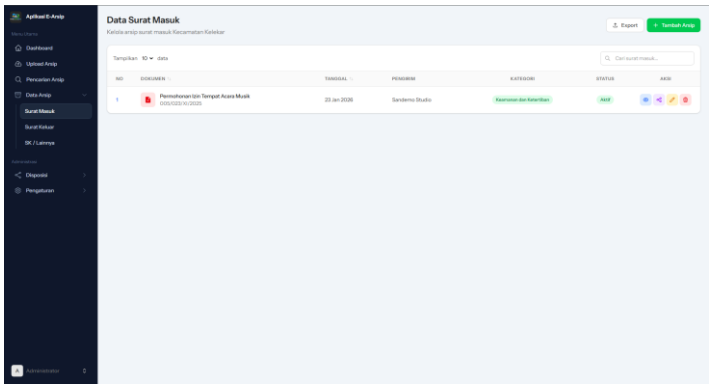

Figure 7. Incoming Mail Archive Data

Send Disposition, A crucial feature for Admins/Leaders to distribute tasks. On this page, users select incoming mail and specify recipient staff and follow-up instructions. The system filters the recipient list to prevent sending mail to themselves.

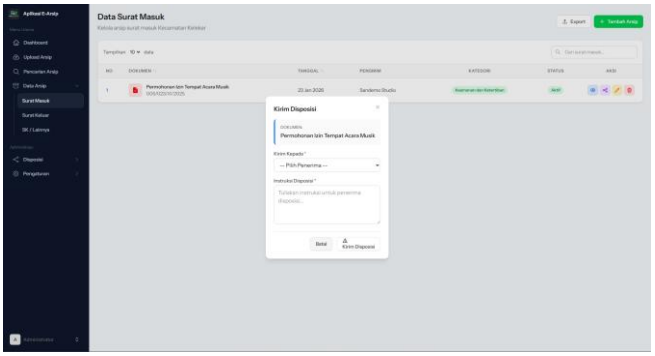

Figure 8. Send Disposition

Edit Incoming Mail Meta, A function for correcting data input errors in incoming mail. Because it uses MongoDB, changes to the data structure (e.g., adding new attributes) can be made without disrupting other stored data.

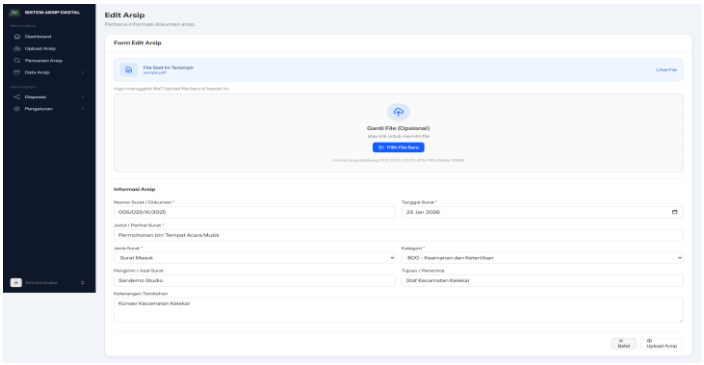

Figure 9. Edit Incoming Mail Meta

Delete Incoming Mail, a feature for deleting invalid or duplicate incoming mail archive data. The system will display a security confirmation before the data is permanently deleted from the database and file storage.

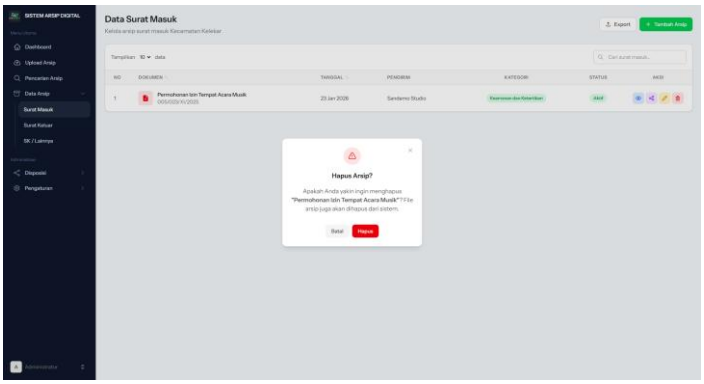

Figure 10. Delete Incoming Mail

Excel Export Results of Incoming Mail Archives, a reporting feature that generates a spreadsheet file (.xlsx) containing a summary of incoming mail data for a specific period. This report is used for physical administration needs or reporting to the district level.

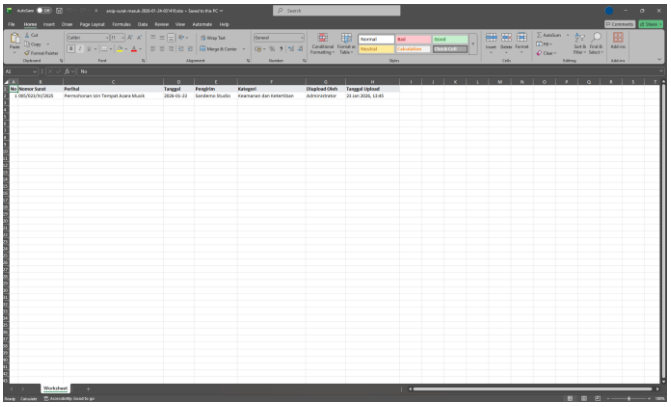

Figure 11. Excel Export Results of Incoming Mail Archives

Outgoing Mail Archive Data, displays a repository of letters issued by the sub-district. This page serves as a digital outgoing mail diary.

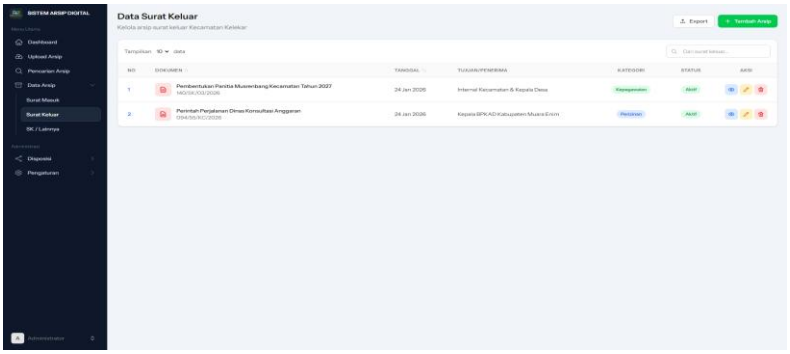

Figure 12. Outgoing Mail Archive Data

Outgoing Mail Meta Details, presents specific attribute information of outgoing mail, such as the mail destination, date of delivery, and related attachments.

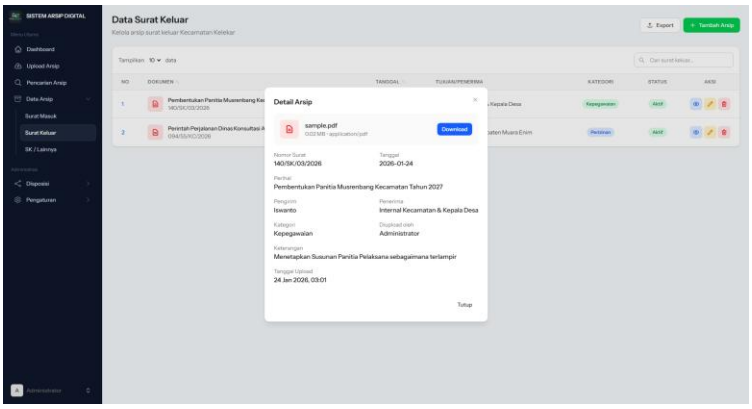

Figure 13. Outgoing Mail Meta Details

Excel Export Results for Outgoing Mail Archives, produce a summary report of outgoing letters for physical archiving purposes or sub-district administration performance audits.

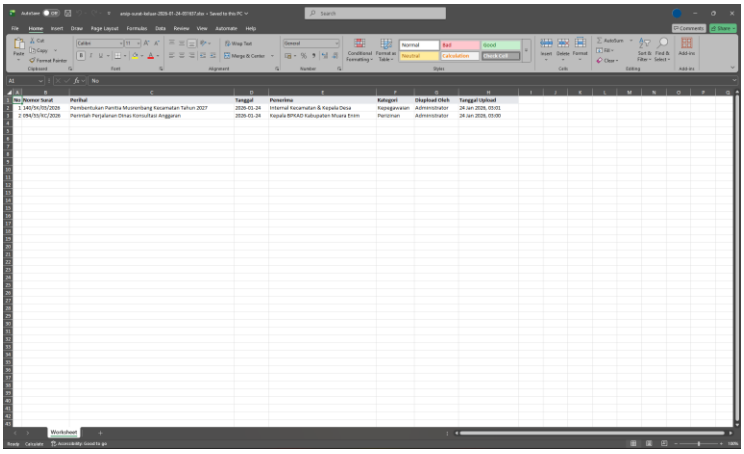

Figure 14. Excel Export Results of Outgoing Mail Archives

SK/Other Archive Data, this page houses documents with heterogeneous data structures, such as Employee Decrees, Permits, and Reports. This is where MongoDB's schema-less advantage comes into play, allowing various document types to appear in a single, unified table.

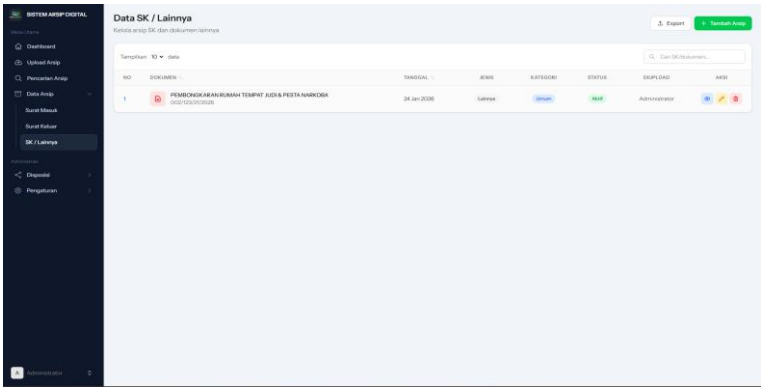

Figure 15. SK/Other Archive Data

Excel Export Results for SK/Other Archives, the function of downloading archive data reports for other categories in a neat and structured Excel format according to its dynamic columns.

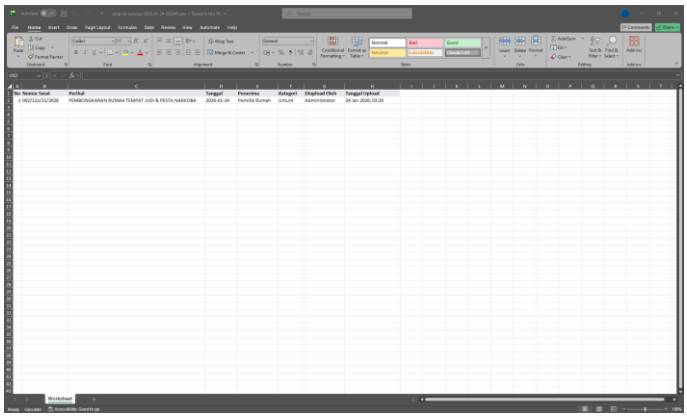

Figure 16. Excel Export Results of SK/Other Archives

Dashboard Staff, a dedicated homepage for employee accounts. The main focus of the display is the "Incoming Tasks" widget and notifications of new dispositions requiring immediate action.

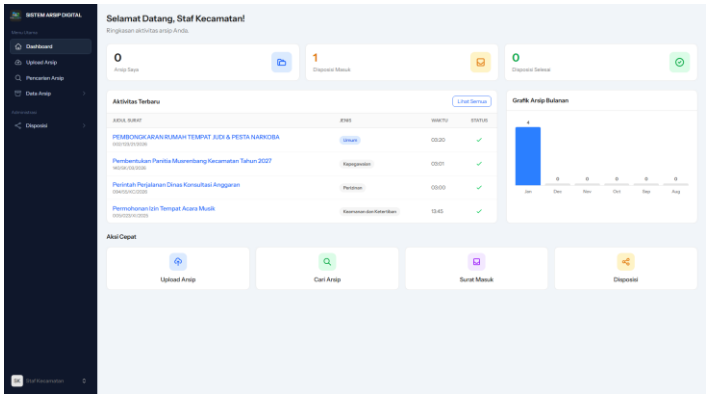

Figure 17. Dashboard Staff

Inbox Disposition, the main menu for staff contains a list of assigned tasks. Each item displays the status (Pending/Reading) and the urgency of the task.

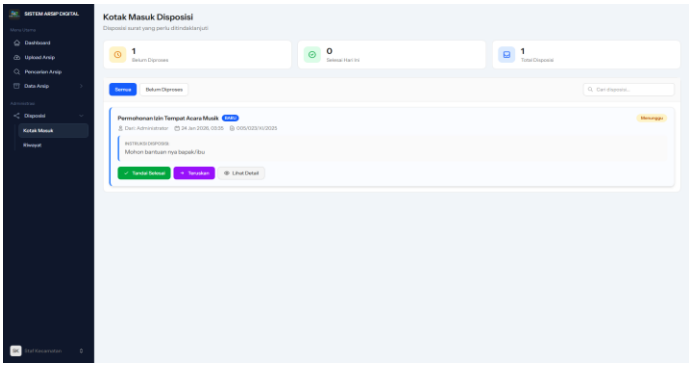

Figure 18. Inbox Disposition

Inbox Disposition Details, staff work page to read management instructions, view related letters, and perform follow-up actions (mark completed or forward disposition).

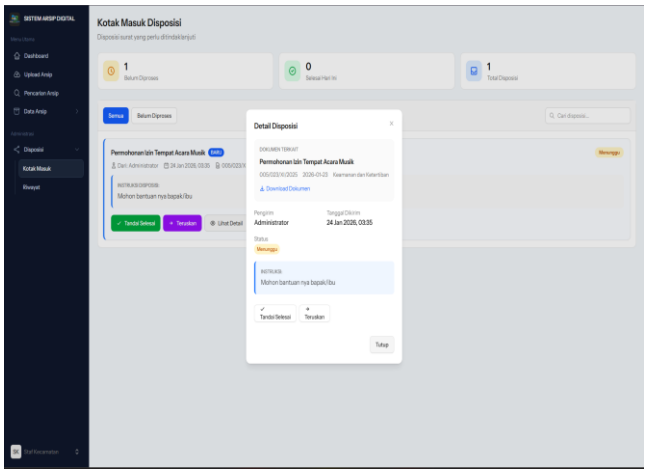

Figure 19. Inbox Disposition Details

History Disposition, staff personal files that record all tasks ever completed or assigned to others.

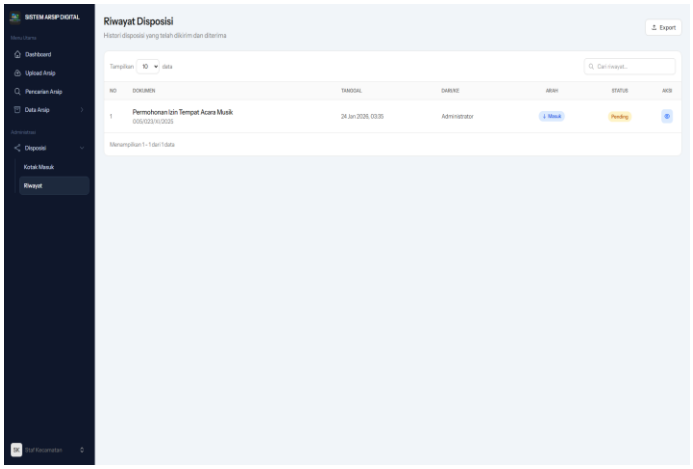

Figure 20. History Disposition

Excel Export Results of Disposition History, feature for staff to print individual performance reports based on the number of dispositions completed.

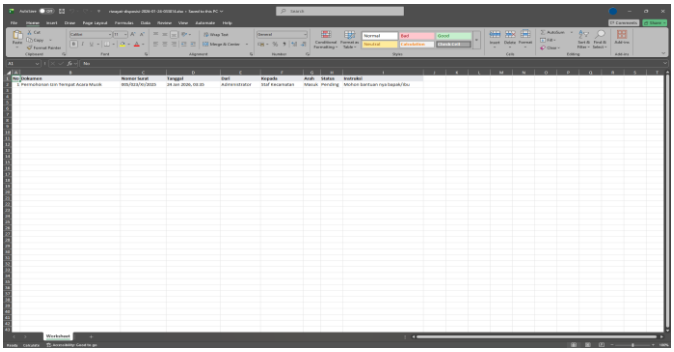

Figure 21. Excel Export Results of Disposition History

User Data Settings (Admin), a dedicated Admin page for managing employee accounts with system access. Displays a list of user names, NIPs, positions, and roles.

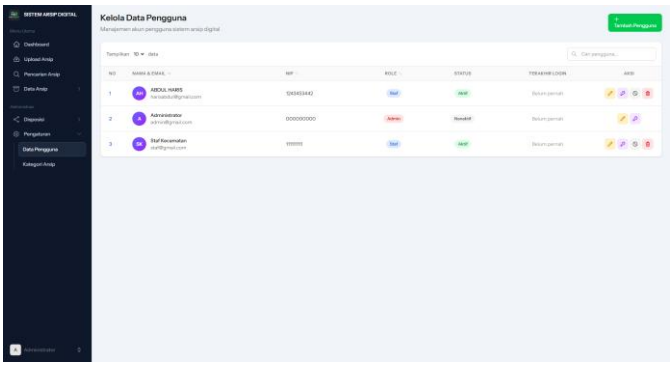

Figure 22. User Data Setting (Admin)

Add User, registration form to register new employees into the system, complete with access rights settings (Admin/Staff)

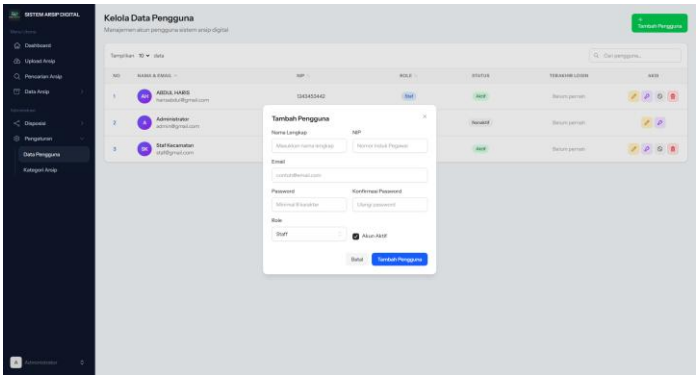

Figure 23. Add User

Edit User, features for updating employee profiles, such as changing positions or correcting names and NIPs.

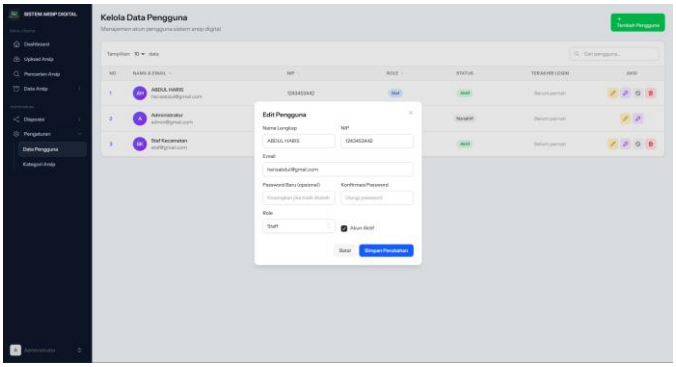

Figure 24. Edit User

Manage Archive Categories, master data page for managing archive classification. Admins can determine which categories are available (e.g., Incoming Letters, Tax Returns, Decrees).

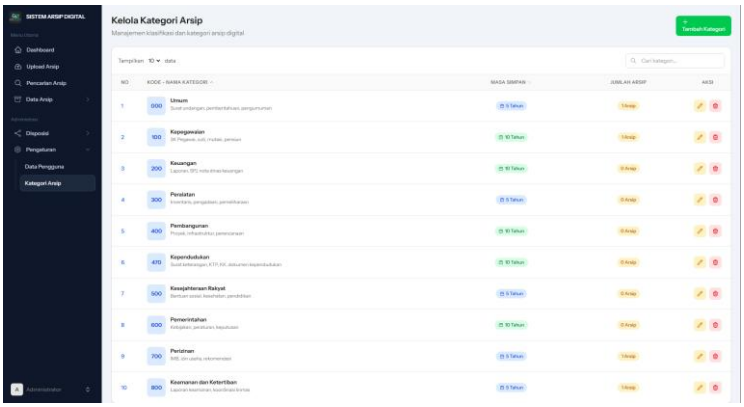

Figure 25. Manage Archive Categories

This implementation focuses on utilizing schema-less architecture to handle the heterogeneity of archive metadata at the kelekar district office. Archive Document Structure (Schema-less); Unlike a relational database management system (RDBMS) approach that requires each entity to have uniform columns, this system stores archive data in BSON (Binary JSON) document format. This allows each archived document to have different attributes depending on its category, yet remain stored in a single collection, the archives collection.

For comparison, here is a representation of the document structure stored in the system. (1) Regular Incoming Mail Archive Documents, in standard incoming mail archives, the attributes stored are only general metadata such as letter number, date, and subject. And (2) Licensing Archive Documents / SK (Decree); This type of archive requires specific metadata that regular mail does not. The system dynamically inserts additional attributes into the dynamic_meta object without changing the global database structure.

```
{
  "_id": ObjectId("65a9f2b8c9e7a8b1d2e3f4a1"),
  "kategori": "Surat Masuk",
  "nomor_surat": "005/102/KC/2026",
  "perihal": "Undangan Rapat Koordinasi",
  "file_path": "uploads/2026/01/undangan_rapat.pdf",
  "created_at": ISODate("2026-01-23T08:30:00Z"),
  "dynamic_meta": {}
}
```

Figure 26. Reguler Incoming mail Archive Documents

```
{
  "_id": ObjectId("65a9f2b8c9e7a8b1d2e3f4a2"),
  "kategori": "Surat Keputusan",
  "nomor_surat": "800/SK/01/2026",
  "perihal": "Pengangkatan Perangkat Desa",
  "file_path": "uploads/2026/01/sk_perangkat.pdf",
  "created_at": ISODate("2026-01-23T09:15:00Z"),
  "dynamic_meta": {
      "nik_pegawai": "160301230001",
      "nama_pegawai": "Budi Santoso",
      "jabatan_baru": "Kepala Seksi Pemerintahan",
      "masa_berlaku": "2026-2031"
  }
}
```

Figure 27. Licensing Archive Documents / SK (Decree)

The implementation of the above structure proves MongoDB's flexibility in handling unstructured data, thus eliminating the need for complex table normalization (JOINs) which usually burdens performance in conventional systems.

To ensure fast data retrieval as archive volumes grow, the system implements MongoDB's built-in Full-Text Search feature. Indexing is performed on crucial fields such as letter_number, subject, and dynamic_meta content. This mechanism allows for real-time archival data searches without overloading server resources, even when searching based on specific attributes (e.g., searching for archives based on a National Identification Number (NIK) in dynamic metadata).

Discussion

The findings of this study demonstrate that the implementation of a MongoDB-based digital archiving system can address key administrative problems faced by the Kelekar District Office, particularly the inefficiency of manual archive management, the rigidity of relational database structures, and the difficulty of retrieving heterogeneous government documents. The results show that the system successfully accommodates various archive categories, including incoming letters, outgoing letters, decrees, licensing documents, disposition records, and staff-related administrative files through a flexible schema-less architecture. The use of a dynamic_meta structure enables each document type to store different metadata attributes without requiring repeated table restructuring or complex normalization. In addition, the integration of Laravel, MongoDB, full-text search, role-based access, document upload, PDF preview, disposition management, and Excel export features indicates that the developed prototype is not merely a storage application, but a functional digital archive management system. These findings directly respond to the study objective, namely to design and implement a NoSQL-based digital archiving system capable of handling heterogeneous administrative records in a local government office.

These results are consistent with international studies showing that document-oriented NoSQL databases are particularly suitable for data environments characterized by flexible, changing, and semi-structured records. Díaz-Ordoñez et al. (2023) argue that document-oriented databases offer greater flexibility than rigid relational structures when managing complex historical records whose attributes may evolve over time. This aligns with the present study, where government archives such as decrees, permits, citizen service files, and routine correspondence contain different metadata patterns that cannot be efficiently represented through a single fixed relational schema. Similarly, Blanco et al. (2022) emphasize that NoSQL document databases require careful design because their flexibility must be accompanied by security policies and structured governance mechanisms. The present study supports this view by demonstrating the technical usefulness of MongoDB, but it also implies that flexibility alone is insufficient without authentication, role-based access, data backup, and security control. Thus, while global studies confirm the architectural value of NoSQL databases, this study extends the discussion by showing how such flexibility can be applied to small-scale government archival workflows in Indonesia.

The findings also correspond with Indonesian studies on digital archive systems conducted between 2020 and 2026. Churiyah et al. (2020) showed that archive management in the digital era can support village administration by improving accessibility and administrative order. Caroline et al. (2022) found that the implementation of the Dynamic Archival Information System (SIKD) helped

digitize dynamic records, although implementation was constrained by human resources and internet stability. Oyama et al. (2021) similarly developed a web-based e-archives system in a university context that improved storage efficiency, archive security, and retrieval processes. More recently, Syah et al. (2026) reported that digital archive management in a police administrative unit improved correspondence supervision and operational efficiency. Compared with these studies, the present research offers a more specific technical contribution by using MongoDB's schema-less document model to handle heterogeneous archive metadata at the sub-district level. This distinction is important because many local archive systems remain web-based but still rely on more rigid database structures.

However, this study also diverges from several local implementations. Studies on SIKD and other digital archive platforms often emphasize institutional readiness, workflow effectiveness, and archive governance, whereas the present study emphasizes database architecture, system prototyping, and metadata flexibility. Kusumawardhani et al. (2023), for instance, identified that the effectiveness of SIKD in schools was influenced by user workload and response delays, indicating that system success depends not only on software design but also on organizational capacity. Rahmadanty et al. (2023) also highlight the changing role of archivists in the digital era, suggesting that archive digitization requires new competencies in digital record handling, data organization, and system-based administration. These findings suggest that the Kelekar system, although technically effective, must be supported by staff training, clear standard operating procedures, and sustained institutional commitment. Without these supporting elements, the system may reproduce old administrative problems in a digital form.

Theoretically, this study reinforces socio-technical system thinking in public-sector information system development by showing that the success of a digital archive system depends not only on database selection or interface design, but also on the interaction among technology, users, work routines, organizational rules, and service needs. The findings support the relevance of NoSQL databases for managing dynamic and heterogeneous archival data, while also confirming the suitability of prototyping when user requirements are not fully defined at the initial stage. Through communication, rapid modelling, prototype development, testing, and iterative refinement, the system was able to respond more closely to the administrative needs of Kelekar District Office. Practically, the study highlights the need for structured staff training in document classification, metadata entry, digital disposition, file validation, search procedures, and data security. It also offers an applied learning model for information systems and informatics education, particularly in database design, public-sector software development, and user-centered prototyping. Thus, digital archive systems should be understood not merely as technical tools, but as instruments for strengthening work discipline, document accountability, service responsiveness, digital confidence, and procedural consistency.

The policy implications are equally significant. At the local government level, digital archive systems should be integrated into broader e-government and electronic-based government system agendas. Widiyawati et al., (2023) emphasize that records and archives play an important role in public service policy decision-making because they function as organizational memory, information resources, and accountability instruments. Therefore, the Kelekar system should not remain an isolated application; it should be aligned with district-level digital governance policies, archival regulations, and interoperability standards. Future policy development should address data

retention schedules, user access rights, document authenticity, electronic signatures, audit trails, cloud backup, and integration with population or regional government information systems. Moreover, because government archives may contain sensitive citizen data, policies on data protection and cybersecurity must be embedded from the beginning of system implementation.

The novelty of this study lies in its application of MongoDB's schema-less architecture to a local government archive system with heterogeneous metadata characteristics. Unlike conventional web-based archive applications that merely digitize incoming and outgoing letters, this study demonstrates how a NoSQL document model can accommodate different archive structures within a unified collection. The use of dynamic metadata, full-text search, Laravel-MongoDB integration, PDF preview, role-based dashboard, disposition tracking, and Excel reporting contributes to a more adaptive model of archive management for sub-district offices. Methodologically, the study also contributes by combining applied research, descriptive-constructive analysis, and prototyping to produce a practical system solution grounded in real administrative needs.

Nevertheless, several limitations must be acknowledged. First, the study was conducted in one sub-district office, meaning that the findings may not be fully generalizable to other government institutions with different archive volumes, infrastructure, or bureaucratic procedures. Second, the evaluation appears to rely mainly on user feedback and functional testing, without detailed quantitative measurement of retrieval time, system usability scores, server performance, or comparative benchmarking against SQL-based systems. Third, the study has not yet examined long-term issues such as data migration, backup reliability, disaster recovery, legal validity of digital documents, or cybersecurity risks. Future research should therefore expand implementation to multiple government offices, compare MongoDB performance with relational and hybrid database models, apply standardized usability testing, measure search latency quantitatively, and evaluate user adoption over time. Further studies should also explore integration with certified electronic signatures, SRIKANDI, Dukcapil databases, mobile disposition systems, and cloud-based archival preservation. By addressing these dimensions, future research can transform the current prototype into a more robust, scalable, and policy-aligned digital archive ecosystem for local government administration.

Conclusion

As a result, the implementation of a NoSQL database using MongoDB has proven effective in handling the characteristics of heterogeneous government archive data. The schema-less concept in MongoDB allows the system to store various document metadata variations in a single flexible collection without the limitations of a rigid table structure. The implementation of full-text search technology and a Single Page Application-based application architecture (using Laravel Livewire) has significantly improved the efficiency of document search time. Employees can search for old archives based on specific keywords or dynamic metadata parameters with low latency compared to manual search methods

Based on the results of the system design, implementation, and testing at the kelekar district office, it can be concluded that digital archiving software has been successfully developed using the prototyping method, replacing conventional document management. This system is capable of digitizing the flow of incoming and outgoing mail previously recorded manually, thereby reducing the risk of physical damage and data redundancy. For future system development and refinement to

provide broader benefits, the authors offer several suggestions. The system is recommended to integrate a bsre-certified electronic signature (tte) feature to ensure digital documents have legal force without requiring a wet signature. Furthermore, the system needs to be integrated with the population database (dukcapil) or local government information systems via api to reduce manual data input. Furthermore, improving data security is also crucial through automatic cloud backup mechanisms and implementing two-factor authentication (2fa) to prevent unauthorized access and data loss. Finally, a mobile version (android/ios) is recommended, particularly for the disposition feature, so that managers can combine and issue instructions regarding letters in real time from anywhere.

References

Akib, H., Saleh, S., Nisaa, A. K., & Isgunandar, I. (2022). Electronic based archive management at the office of PT. Jasa Raharja Makassar. *Pinisi Journal of Education and Management, 1*(3), 233–240. https://doi.org/10.26858/pjoem.v1i3.44537

Alqahtani, A., Xie, X., & Jones, M. W. (2021). Literature review of deep network compression. *Informatics, 8*(4), Article 77. https://doi.org/10.3390/informatics8040077

Arshad, M., Brohi, M. N., Soomro, T. R., Ghazal, T. M., Alzoubi, H. M., & Alshurideh, M. (2023). NoSQL: Future of big data analytics characteristics and comparison with RDBMS. In M. Alshurideh, B. H. Al Kurdi, R. Masa'deh, H. M. Alzoubi, & S. Salloum (Eds.), *The effect of information technology on business and marketing intelligence systems* (pp. 1927–1951). Springer International Publishing. https://doi.org/10.1007/978-3-031-12382-5_106

Bansal, N., Sachdeva, S., & Awasthi, L. K. (2024). Are NoSQL databases affected by schema? *IETE Journal of Research, 70*(5), 4770–4791. https://doi.org/10.1080/03772063.2023.2237478

Barthelemy, M., Heather, D., Grotheer, E., Besse, S., Andres, R., Vallejo, F., Barnes, T., Kolokolova, L., O'Rourke, L., Fraga, D., A'Hearn, M. F., Martin, P., & Taylor, M. G. G. T. (2018). ROSETTA: How to archive more than 10 years of mission. *Planetary and Space Science, 150*, 91–103. https://doi.org/10.1016/j.pss.2017.07.004

Bhattacharyya, D. S., Shafique, S., Akhter, S., Rahman, A., Islam, M. Z., Rahman, N., & Anwar, I. (2020). Challenges and facilitators of implementation of an information communication and technology (ICT)-based human resources management tool in the government health sector in Bangladesh: Protocol for an exploratory qualitative research study. *BMJ Open, 10*(12), Article e043939. https://doi.org/10.1136/bmjopen-2020-043939

Blanco, C., García-Saiz, D., García-Rosado, D., Pérez, B., Pruski, C., Mazon, J.-N., Trujillo, J., & Fernández-Medina, E. (2022). Security policies by design in NoSQL document databases. *Journal of Information Security and Applications, 65*, Article 103120. https://doi.org/10.1016/j.jisa.2022.103120

Bueskens, P. (2020). Mothers reproducing the social: Chodorow and beyond. *Journal of Psychosocial Studies, 13*(1), 65–86. https://doi.org/10.1332/147867320X15803493144767

Cahyono, M., Saputra, N. D., & Saputra, A. I. (2023). Transformasi digital pemerintahan: Perubahan organisasi dan budaya pemerintahan melalui teknologi digital. *Jurnal Teknologi Informasi Mura, 15*(2), 9–17. https://doi.org/10.32767/jti.v15i2.2123

Caroline, D. A., Ismanto, B., & Rina, L. (2022). Implementation of digital archives using a dynamic archive information system. *Jurnal Kajian Informasi & Perpustakaan, 10*(2), 189–204. https://doi.org/10.24198/jkip.v10i2.33203

Carter, L. (2024a). *Beginning MongoDB Atlas with .NET: Flexible and scalable document data storage for .NET developers*. Apress. https://doi.org/10.1007/978-1-4842-9550-2

Carter, L. (2024b). Choosing MongoDB. In *Beginning MongoDB Atlas with .NET: Flexible and scalable document data storage for .NET developers* (pp. 3–20). Apress. https://doi.org/10.1007/978-1-4842-9550-2_1

Casadesús de Mingo, A., & Cerrillo-i-Martínez, A. (2018). Improving records management to promote transparency and prevent corruption. *International Journal of Information Management, 38*(1), 256–261. https://doi.org/10.1016/j.ijinfomgt.2017.09.005

Chodorow, K. (2013). *MongoDB: The definitive guide* (2nd ed.). O'Reilly Media.

Churiyah, M., Arief, M., Basuki, A., Dharma, B. A., & Wulandari, A. (2020). Archive management in the digital age: Development of village administration systems. In *Proceedings of the 4th Padang International*

Conference on Education, Economics, Business and Accounting (PICEEBA-2 2019) (pp. 626–632). Atlantis Press. https://doi.org/10.2991/aebmr.k.200305.128

Díaz-Ordoñez, M., Rodríguez Baena, D. S., & Yun-Casalilla, B. (2023). A new approach for the construction of historical databases—NoSQL document-oriented databases: The example of AtlantoCracies. *Digital Scholarship in the Humanities, 38*(3), 1014–1032. https://doi.org/10.1093/llc/fqad033

Dikopoulou, A., & Mihiotis, A. (2012). The contribution of records management to good governance. *The TQM Journal, 24*(2), 123–141. https://doi.org/10.1108/17542731211215071

Engelman, A., Enkvist, C., & Pettersson, K. (2019). A FAIR archive based on the CERIF model. *Procedia Computer Science, 146*, 190–200. https://doi.org/10.1016/j.procs.2019.01.076

Farahzadi, A., Farahsary, P. S., & Rezazadeh, J. (2022). A survey on IoT fog nano datacenters. *Wireless Networks, 28*(1), 173–207. https://doi.org/10.1007/s11276-021-02829-2

Fathurrahman, M. (2018). Pentingnya arsip sebagai sumber informasi. *JIPI (Jurnal Ilmu Perpustakaan dan Informasi), 3*(2), 215–225. https://doi.org/10.30829/jipi.v3i2.3237

Jones, O., Gold, J., & Claxton, J. (2022). An exposition of the constructive research approach: A tactical treatise for addressing methodological and practical issues in organisational research. *International Journal of Organizational Analysis, 31*(7), 3051–3069. https://doi.org/10.1108/IJOA-03-2022-3212

Khan, W., Kumar, T., Zhang, C., Raj, K., Roy, A. M., & Luo, B. (2023). SQL and NoSQL database software architecture performance analysis and assessments—A systematic literature review. *Big Data and Cognitive Computing, 7*(2), Article 97. https://doi.org/10.3390/bdcc7020097

Koderi, Sufian, M., & Erlina. (2023). Developing Lampung local wisdom film of Arabic communication skills for Madrasah Tsanawiyah students. *International Journal of Information and Education Technology, 13*(12), 2004–2013. https://doi.org/10.18178/ijiet.2023.13.12.2015

Kusumawardhani, A., Ibad, I., Dirgatama, C. H. A., Utomo, I. H., & Suryawati, R. (2023). Effectiveness of dynamic archive system (SIKD) in dynamic archival management in vocational school. *Economic Education Analysis Journal, 12*(1), 59–68. https://doi.org/10.15294/eeaj.v12i1.64879

Li, F., Zhou, X., Cai, P., Zhang, R., Huang, G., & Liu, X. (2025). *Cloud native database*. Springer Nature Singapore. https://doi.org/10.1007/978-981-97-4057-4

Lombardi, M., Pascale, F., & Santaniello, D. (2021). Internet of Things: A general overview between architectures, protocols and applications. *Information, 12*(2), Article 87. https://doi.org/10.3390/info12020087

Martinez-Mosquera, D., Navarrete, R., & Lujan-Mora, S. (2020). Modeling and management big data in databases—A systematic literature review. *Sustainability, 12*(2), Article 634. https://doi.org/10.3390/su12020634

Mohammad, S. I., Almajali, R. M. I., Al-Momani, A. M., Vasudevan, A., Aburub, F. A. F., Al refai, Y. A. M., Alsha'ar, H. Y., Mohammad, R. I., & Alzyoud, M. (2024). Effect of the quality of electronic archiving on the organizational development of private hospitals. In S. Reyad & A. Hannoon (Eds.), *Frontiers of human centricity in the artificial intelligence-driven society 5.0* (pp. 165–177). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-73545-5_15

Muhidin, S. A., Winata, H., & Santoso, B. (2016). Pengelolaan arsip digital. *Jurnal Pendidikan Bisnis dan Manajemen, 2*(3), 178–183.

Ntorukiri, T. B., Kirugua, J. M., & Kirimi, F. (2022). Policy and infrastructure challenges influencing ICT implementation in universities: A literature review. *Discover Education, 1*, Article 19. https://doi.org/10.1007/s44217-022-00019-6

Oyama, S., Wahana, A., & Widagsa, R. (2021). A web based e-archives information system design in Universitas PGRI Yogyakarta. *Journal of Physics: Conference Series, 1823*(1), Article 012037. https://doi.org/10.1088/1742-6596/1823/1/012037

Patterson, C. (2016). Perceptions and understandings of archives in the digital age. *American Archivist, 79*(2), 339–370. https://doi.org/10.17723/0360-9081-79.2.339

Pressman, R. S. (2010). *Software engineering: A practitioner's approach* (7th ed.). McGraw-Hill.

Putra, Y. V. (n.d.). *Perancangan dan implementasi sistem arsip digital berbasis web di TVRI Stasiun Jawa Barat*. Sekolah Tinggi Manajemen Informatika dan Komputer.

Rahmadanty, L., Zainal, V. R., & Hakim, A. A. (2023). Archivist and archives management in digital era. *Greenation International Journal of Tourism and Management, 1*(2), 203–211. https://doi.org/10.38035/gijtm.v1i2.67

Ranosa, C. A. S., Taufik, T., & Suganda, D. (2026). Digital transformation of archival management through the SRIKANDI application: A study at the Banda Aceh Library and Archives Office. *Journal of Public Policy, Governance and Local Government, 1*(1), 47–56. https://journal.unesa.ac.id/index.php/jppglg/article/view/52416

Rokhman, R., Diana, N., Etek, Y., Koderi, K., & Sufian, M. (2024). The development of a scientific-based academic supervision management model. *AL-ISHLAH: Jurnal Pendidikan, 16*(2), 1383–1398. https://doi.org/10.35445/alishlah.v16i2.4626

Sadalage, P. J., & Fowler, M. (2012). *NoSQL distilled: A brief guide to the emerging world of polyglot persistence*. Addison-Wesley Professional.

Serour, R. O. H., Musolin, M. H., & Huda, M. (2026). Digital archive management system development in Islamic education: Critical review from recent literature. In R. Silhavy & P. Silhavy (Eds.), *Software engineering: Emerging trends and practices in system development* (pp. 275–290). Springer Nature Switzerland. https://doi.org/10.1007/978-3-032-04581-2_20

Silvia, A., Dewita, Y., & Oktaviani, E. (2019). Model of preventive preservation archives in realizing the good governance at the Bank Indonesia Office Prov. Indonesia's West Sumatra. In *Proceedings of the 1st International Conference on Economics, Business, Entrepreneurship, and Finance (ICEBEF 2018)* (pp. 752–758). Atlantis Press. https://doi.org/10.2991/icebef-18.2019.158

Siwu, T. G., Pinontoan, B., & Arundaa, R. (2023). E-archive document information system: Case study of SMP Negeri 12 Dumoga. *Indonesian Journal of Intelligence Data Science, 1*(1), 43–53.

Syah, R. D., Kurniawan, A. A., Kusuma, M. R., & Ariyani, R. (2026). Implementation of digital archive management in the administration of International Missions Police Bureau. *Jurnal Sisfokom (Sistem Informasi dan Komputer), 15*(2), 285–293. https://doi.org/10.32736/sisfokom.v15i02.2622

Tella, A., Amuda, H. O., & Ajani, Y. A. (2022). Relevance of blockchain technology and the management of libraries and archives in the 4IR. *Digital Library Perspectives, 38*(4), 460–475. https://doi.org/10.1108/DLP-08-2021-0065

Tortolero Osuna, J. A., & Rosales Silva, A. J. (2019). Parallel peer group filter for impulse denoising in digital images on GPU. *Computing and Informatics, 38*(6), 1320–1340. https://doi.org/10.31577/cai_2019_6_1320

Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems, 28*(2), 118–144. https://doi.org/10.1016/j.jsis.2019.01.003

Wibowo, D. K., Darmawan, A., & Nawangnugraeni, D. A. (2025). A comparative study of multi-master replication of NoSQL database server with varying data formats. *Jurnal Teknik Informatika (Jutif), 6*(1), 411–418. https://doi.org/10.52436/1.jutif.2025.6.1.4371

Widiyawati, A. T., Putri, A. A., Aminaturrokhiyah, A., Kumkong, P., & Prasetyo, A. H. (2023). The role of records and archives in public service policy decision-making. In *Proceedings of the International Conference of Public Administration and Governance (ICOPAG 2022)* (pp. 37–50). Atlantis Press. https://doi.org/10.2991/978-2-38476-082-4_5