

Intelligent Audio-Text Digital Archiving System for Court Proceedings Documentation

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ABSTRACT

Court proceedings documentation plays a crucial role in preserving legal records and ensuring efficient access to judicial information. However, conventional documentation and archiving processes often rely on manual procedures, leading to inefficiencies, difficulties in information retrieval, and inconsistencies in records management. This study aims to develop an intelligent audio-text digital archiving system for court proceedings to improve the effectiveness and efficiency of judicial record management through the integration of audio and textual data. The system was developed using the waterfall software development model, which consists of the requirements analysis, system design, implementation, testing, and maintenance phases. The proposed system provides functionalities such as audio recording management, text-based documentation, digital data storage, indexing, and search capabilities to facilitate efficient access to archived records. System testing was conducted to evaluate the functionality and usability of the system in supporting court documentation activities. The results indicate that the developed system improves documentation efficiency, simplifies information retrieval, and enhances the accuracy and reliability of court records. Furthermore, the proposed system contributes to the digital transformation of judicial information management by providing a more structured, efficient, and intelligent archiving solution.

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1. INTRODUCTION

The rapid advancement of digital transformation has significantly reshaped the paradigm of organizational information management, particularly in the field of documentation and digital archiving systems. Digital archiving systems are no longer limited to functioning merely as electronic document storage media; instead, they have evolved into intelligent systems capable of supporting various information management processes, including automated retrieval, classification, indexing, and information extraction. The implementation of digital technologies in archival systems offers several advantages, including improved data accessibility, reduced information redundancy, enhanced data security, and stronger support for information-based decision-making processes [1], [2]. Furthermore, the advancement of artificial intelligence (AI) technologies has expanded the capabilities of archival systems through automation in documentation processes, metadata generation, and improved accessibility to archived information [3], [4].

In the governmental sector, documentation and archival management play an essential role in maintaining transparency, accountability, and administrative effectiveness. Effective documentation practices ensure the availability of accurate, structured, and easily accessible information to support both administrative processes and strategic decision-making. As an institution responsible for supporting administrative and legislative activities, the Secretariat of the Regional House of Representatives of South Sumatra Province has the responsibility to manage various legislative and meeting-related documents. One of its important units is

the Session and Legislation Division, which is responsible for managing meeting agendas, preparing minutes, and documenting legislative activities. Therefore, an effective documentation system is crucial to ensure that meeting information can be properly stored, managed, and utilized.

Despite the importance of documentation activities, the archival process of meeting minutes at the Secretariat of the the Secretariat of the Regional House of Representatives of South Sumatra Province still encounters several limitations. Audio recording activities and meeting-minute transcription processes are currently performed separately and have not been integrated into a centralized digital archiving system. This condition reduces documentation efficiency, increases the risk of information loss, and complicates the retrieval and management of archived information. Moreover, the validation and distribution of meeting reports are still conducted manually using printed documents, which potentially slows administrative workflows and decreases operational efficiency.

Recent developments in automatic speech recognition (ASR) and speaker recognition technologies have created significant opportunities to improve automated digital documentation systems. ASR technology enables computer systems to automatically convert spoken language into textual information with increasingly higher levels of accuracy through the utilization of deep learning and transformer-based approaches [5], [6]. Recent studies have demonstrated that speech recognition systems based on neural networks can significantly improve documentation efficiency in various sectors, including healthcare documentation and digital archives [6], [7]. In addition, speaker recognition technology enables systems to identify individuals based on unique vocal characteristics, thereby facilitating more structured information categorization and management [8].

Several previous studies have shown that the application of AI technologies in archival systems contributes significantly to improving information and documentation management. Research conducted by Davet et al. [1] indicated that AI integration in archival systems enhances accountability and automates information management processes. Other studies have demonstrated that AI-based document digitization improves accessibility and the efficiency of archival processing [2]. Furthermore, AI-assisted metadata generation technologies have been reported to accelerate document classification and retrieval processes [9]. Studies on audio archives have also shown that integrating speech recognition and natural language processing (NLP) technologies can improve voice-based information retrieval and management systems [10].

However, most existing studies have primarily focused on either digital archiving systems, speech recognition technologies, or metadata management independently. Studies integrating audio recording, speech-to-text conversion, speaker identification, digital archiving, and information retrieval into a unified intelligent platform specifically designed for government meeting documentation remain relatively limited. This condition indicates the existence of a research gap that requires further investigation to develop a more integrated and efficient documentation system.

To address these challenges, this study proposes the development of an intelligent audio- and text-based digital archiving system for meeting documentation that integrates audio recording processes, speech-to-text conversion, and digital archive management into a centralized platform. The system is developed using the waterfall software development model due to its systematic and structured stages, including requirement analysis, system design, implementation, testing, and maintenance.

The main contribution of this study is the development of an integrated intelligent digital archiving system designed to support automated meeting documentation processes. Specifically, this research aims to: (1) develop an intelligent audio- and text-based digital archiving system for meeting documentation; (2) improve the efficiency of documentation and meeting-minute preparation processes for administrative staff; and (3) enhance archive management and information retrieval through a more systematic digital platform. The proposed system is expected to support digital transformation in governmental administrative processes and improve the operational efficiency of documentation management.

2. METHOD

This study employed a research and development approach to design and implement an Intelligent audio and text-based digital archiving system for meeting documentation at the Secretariat of the Regional House of Representatives of South Sumatra Province. The proposed system was developed using the software development life cycle (SDLC) with the waterfall model. The waterfall model was selected because it provides a systematic and structured framework that is suitable for projects with clearly defined requirements and stable development objectives [11], [12]. The sequential nature of the waterfall approach facilitates systematic planning, implementation, and evaluation processes, thereby improving development quality and reducing ambiguity during system construction [1]. Recent studies have shown that structured development approaches remain relevant for information systems requiring high documentation accuracy and clear development stages [13].

The waterfall method consists of five main stages: needs analysis, system design, system implementation, system testing, and system maintenance [14], [15]. The overall research stage framework is shown in Figure 1.

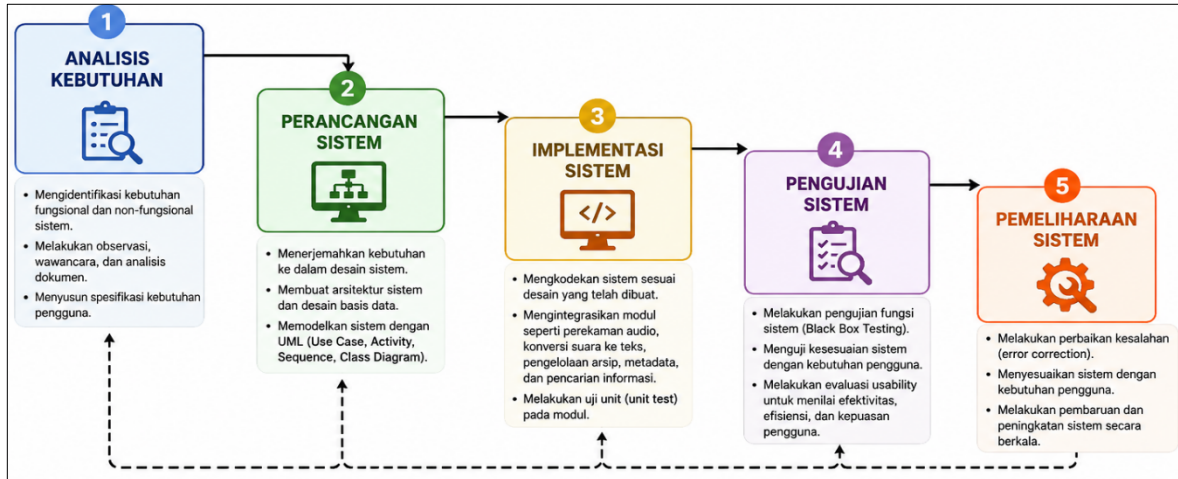


Figure 1. Waterfall method

2.1. Requirement analysis

The requirements analysis phase aims to identify the system's functional and non-functional requirements through observations, interviews, and document analysis conducted within the Session and Legislation Division of the Regional Representative Council Secretariat. Functional requirements focused on identifying processes related to audio recording, speech-to-text conversion, archive management, metadata creation, information retrieval, and report generation.

Requirement elicitation is considered a critical stage in software development because incomplete requirement specifications may significantly affect system quality and project success [16]. In intelligent information systems, proper requirement analysis contributes to improving system usability and operational effectiveness [3].

2.2. System design

The system design stage is carried out to translate user requirements into technical specifications and system architecture. In this study, the system modeling tool used is a use case diagram to illustrate system functions and the interactions between users and system components. The use case diagram can be seen in Figure 2.

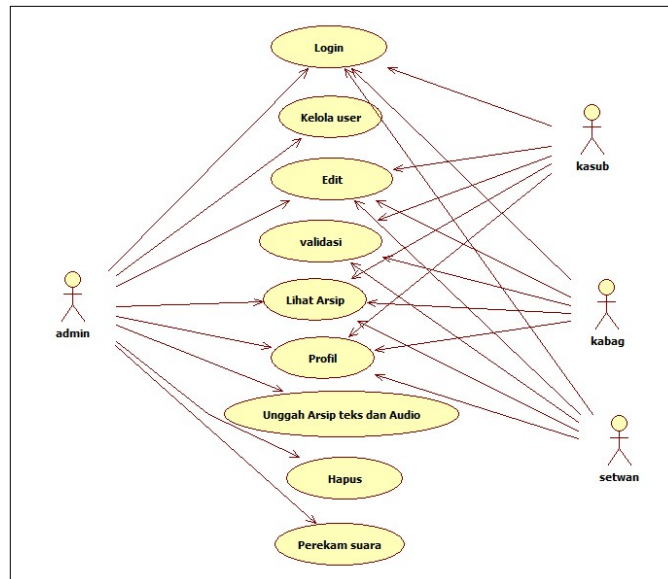


Figure 2. Use case diagram application design

Figure 2 presents the use case diagram modeling used to describe the behavior of the system to be developed. There are four actors with different access rights. The first actor is the Admin, who can manage document archiving and meeting audio files, as well as record meeting audio and simultaneously convert it into text. The second actor is the Head of Subdivision, who can validate meeting files uploaded by the admin and edit

transcript files. The third actor is the head of division, who can validate meeting files uploaded by the admin and edit transcript files. The fourth actor is the Council Secretary, who can validate meeting result files and approve meeting minutes by signing the files uploaded by the admin, as well as edit transcript files.

2.3. System implementation

The implementation stage is carried out by developing the system based on the previously designed architecture. At this stage, the system is developed by integrating audio recording features, speech-to-text conversion, and digital archive management into a centralized platform. The implementation process is conducted to ensure that all system functions operate in accordance with user requirements

2.4. System testing

The testing phase is conducted to ensure that the system operates in accordance with the specified functional requirements. Testing is carried out using the Black Box Testing method by examining the system's input and output functions without reviewing the program code structure. In addition, a usability evaluation is performed to determine the level of effectiveness, efficiency, and user satisfaction with the developed system.

2.3. System maintenance

The maintenance phase is carried out after the system has been implemented to maintain system performance and sustainability. Maintenance activities include error correction, system updates, and feature adjustments according to user needs to ensure that the system continues to operate optimally.

3. RESULTS AND DISCUSSION

3.1. System development results

This study successfully developed an intelligent audio- and text-based digital archiving system designed to support meeting documentation processes at the Secretariat of the Regional House of Representatives of South Sumatra Province. The developed system integrates audio recording, speech-to-text conversion, digital archive management, and information retrieval into a centralized platform.

The system was developed using the waterfall method, which consists of requirement analysis, system design, implementation, testing, and maintenance stages. The implementation results indicate that the proposed system can facilitate administrative staff in managing meeting documentation more efficiently compared to conventional manual approaches.

The developed system consists of several main modules, namely:

1. Audio recording and speech-to-text module

This module functions to record the course of the meeting directly through the system while automatically converting the recorded audio into text using ASR technology. The recorded audio files are automatically stored in the digital archive database and then processed to generate meeting transcripts in real-time or after the recording process is completed. The integration of audio recording and speech-to-text features within a single module helps accelerate the documentation process, reduce manual minute-taking tasks, and improve the efficiency of managing trial documentation. This interface can be seen in Figure 3.

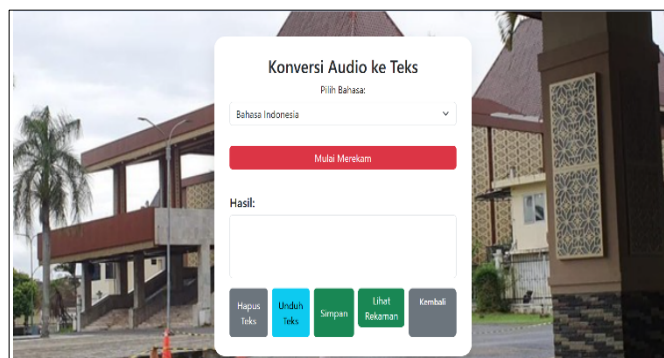


Figure 3. Audio recording and speech-to-text module

2. Digital archive management module

This module is used to manage meeting documentation data such as meeting agendas, transcript results, archive categories, metadata, and supporting documents in a structured manner. This interface can be seen in Figure 4 and 5.

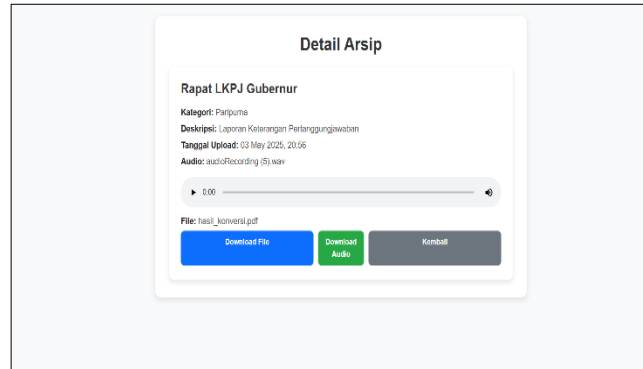


Figure 4. Archive details

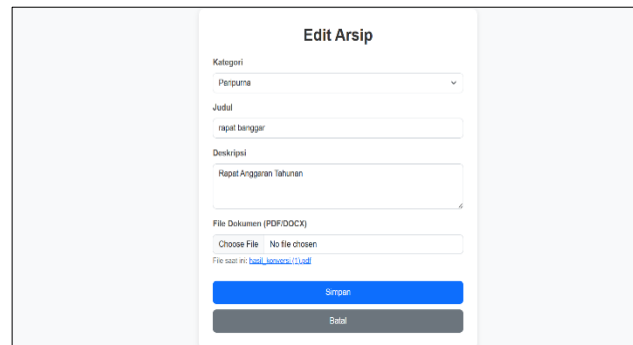


Figure 5. Edit archive

3. Information search and report management module

This module functions to search meeting archive information while simultaneously managing digital documentation reports within an integrated system. Users can search archive data based on keywords, meeting dates, document categories, and other metadata quickly and efficiently. In addition, this module supports the management, validation, and storage of meeting minutes reports, thereby facilitating the structured distribution and access of documents. The integration of information search and report management features helps improve administrative effectiveness, accelerate the archive retrieval process, and support more systematic and centralized management of trial documentation. The search feature allows users to retrieve archived meeting information efficiently using keywords, meeting dates, or document categories. his interface can be seen in Figures 6.

No	Judul	Kategori	Deskripsi	Tanggal Upload	Status Validasi
1	BANGGAR	BANGGAR	PEMBAHASAN MASALAH ANGGARAN	04 Aug 2025, 11:03	Validasi Setwan (Final)
2	BANMUS	BANMUS	MUSYAWARAH	04 Aug 2025, 11:02	Validasi Kabag
3	PARIPURNA	PARIPURNA	PEMBAHASAN LKPJ GUBERNUR	04 Aug 2025, 11:01	Validasi Kasub

Figure 6. Archive report

3.1. System testing results

System testing was conducted using the black box testing method to ensure that all system features operated in accordance with the functional requirements. Testing was performed on each main system module, namely the audio recording and speech-to-text module, the digital archive management module, and the information search and report management module.

1. In the audio recording and speech-to-text module, the system successfully recorded meeting audio, automatically stored audio files, and converted speech into text using automatic speech recognition (ASR) technology. This feature helps accelerate the process of preparing meeting minutes and reduces manual typing activities. The interface of this module is shown in Figure 3.
2. In the digital archive management module, the system was able to store, display, and manage meeting archive data such as meeting agendas, transcript results, metadata, and supporting documents in a structured manner. In addition, the archive editing feature can be used to update documentation data. The interface of this module is shown in Figure 4 and Figure 5.
3. In the information search and report management module, the system successfully displayed archive data based on keywords, meeting dates, document categories, and other metadata. The system also supports digital management of meeting minutes reports, thereby simplifying the validation and distribution process of documents. The interface of this module is shown in Figure 6.

Overall, the testing results indicate that the system operates properly and is capable of improving the efficiency of documentation processes, archive management, and information retrieval within the Secretariat of the Regional House of Representatives of South Sumatra Province.

3.2. Discussion

The results of this study indicate that the developed intelligent audio- and text-based digital Archiving System can improve the efficiency of meeting documentation processes at the Secretariat of the DPRD of South Sumatra Province. The integration of audio recording, speech-to-text conversion, digital archiving, and information retrieval within a single platform simplifies administrative workflows and reduces manual documentation activities. The implementation of automatic speech recognition (ASR) technology enables meeting recordings to be automatically converted into text, thereby accelerating the preparation of meeting minutes and reducing the risk of human error during manual transcription. In addition, the centralized digital archive management system improves document organization and facilitates faster information retrieval based on keywords, meeting dates, or document categories. The testing results also demonstrate that the system can support more structured and efficient archive management. The digital report management feature simplifies document validation and distribution processes, thus improving administrative effectiveness within the organization. However, several limitations were identified during implementation. The accuracy of speech-to-text conversion may decrease when audio quality is poor or when multiple participants speak simultaneously. Furthermore, system performance is influenced by network stability and hardware capability during the recording and transcription processes. Overall, the developed system demonstrates that the integration of AI-based speech recognition technology with digital archive management can effectively support digital transformation in governmental documentation processes and improve operational efficiency in meeting administration.

4. CONCLUSION

This study successfully developed an intelligent audio- and text-based digital archiving system to support meeting documentation processes at the Secretariat of the DPRD of South Sumatra Province. The developed system integrates audio recording, speech-to-text conversion using automatic speech recognition (ASR), digital archive management, and information retrieval into a centralized platform. The testing results indicate that the system can improve the efficiency of meeting documentation, simplify digital archive management, and accelerate information retrieval and report management processes. Overall, the proposed system is capable of supporting digital transformation in governmental administration and improving the effectiveness of meeting documentation management.

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