



DIGITAL PRESERVATION OF NIAS LANGUAGE THROUGH A WEB-BASED DICTIONARY SYSTEM

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KEYWORD

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Digital Dictionary;
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Web-Based System;
Speech-to-Text.

ABSTRACT

The Nias language is one of the regional languages that plays a significant role in preserving the cultural identity of the Nias community. However, the rapid advancement of technology and globalization has contributed to a decline in the use of the Nias language, particularly among younger generations. In addition, the limited availability of learning resources and digital dictionaries has made it difficult for the community to understand and learn Nias vocabulary. This study aims to develop a web-based Nias language dictionary system as a digital learning medium and a tool for preserving the local language. The research employed a System Development Research approach using the Waterfall model, which consisted of requirements analysis, system design, implementation, and testing phases. Data were collected through a questionnaire distributed to 65 respondents in South Nias Regency. The system was designed using Unified Modeling Language (UML), including use case diagrams, activity diagrams, sequence diagrams, class diagrams, and state diagrams. The results indicate that the system was successfully implemented with features such as vocabulary search, language translation, speech-to-text, text-to-speech, and vocabulary management by administrators. Black Box Testing results demonstrated that all system functionalities operated in accordance with the specified requirements. Furthermore, 85% of respondents stated that the digital dictionary helped them better understand Nias vocabulary. This study produced a web-based Nias language dictionary system that functions not only as a vocabulary retrieval tool but also as an interactive learning platform that supports the preservation of the Nias language in the digital era.

INTRODUCTION

Language is a communication tool used by humans to convey thoughts, ideas, emotions, and information in daily life. Beyond its communicative function, language serves as a cultural identity and a heritage that is transmitted from one generation to another. Based on linguistic studies and official government data, Indonesia is recognized as one of the countries with the highest levels of linguistic and ethnic diversity in the world. According to the Language Development and Fostering Agency, approximately 718 regional languages have been identified and validated across Indonesia [1]. Furthermore, data from the Population Census conducted by the Central Statistics Agency (BPS) indicate that Indonesia is home to approximately 1,340 ethnic groups distributed throughout the archipelago [2]. Language exhibits various forms of variation within society, one of which is dialect. A dialect refers to a language variety used by a particular community based on geographical, social, or cultural factors. Dialectal differences can be observed in pronunciation, vocabulary, intonation, and sentence structure. One of the regions in Indonesia characterized by significant

dialectal diversity is Nias Island. Nias Island is located in the western part of North Sumatra Province and lies in the Indian Ocean. Administratively, the island consists of several regencies and one municipality, namely Nias Regency, South Nias Regency, North Nias Regency, West Nias Regency, and Gunungsitoli City [3].

The geographical characteristics of an archipelagic region have contributed to the development of distinct languages and dialects across different areas. From a socio-cultural perspective, the people of Nias maintain strong traditional customs that continue to be preserved, including the stone-jumping tradition, traditional funeral ceremonies, customary marriage rituals, kinship systems, and the Omo Hada traditional house, which represents a distinctive symbol of Nias culture [4]. This cultural diversity influences language use in everyday communication, resulting in the emergence of various dialects and regional language variations across the island. The Nias language constitutes an essential component of community identity, as it is widely used in communication, traditional ceremonies, and the transmission of cultural values from generation to generation [5]. Differences in dialects and vocabulary pronunciation also serve as distinguishing characteristics that can help identify an individual's regional origin within Nias Island. The rapid advancement of information and communication technology has significantly influenced communication patterns within society, including the use of regional languages. In the digital era, the use of local languages has gradually declined, as people particularly younger generations tend to communicate more frequently in Indonesian and foreign languages [6]. A similar trend has begun to affect the use of the Nias language within local communities. To investigate this issue, data were collected in South Nias Regency through a questionnaire distributed to 65 respondents from various districts, including Amandraya, Aramo, Boronadu, Fanayama, Gomo, Hibala, Hiliduho, Hilimegai, Hilisalawahe, Huruna, Idanotae, Lahusa, Lolomatua, Lolowau, Luahagundre Maniamolo, Maniamolo, Mazino, Mazo, Oou, Onohazumba, Onolalu, Batu Islands, West Batu Islands, East Batu Islands, North Batu Islands, Siduaori, Simuk, Somambawa, Susua, Tanah Masa, Teluk Dalam, Toma, Ulu Idanotae, Ulunoyo, and Ulususua [7]. The questionnaire results revealed that 29 out of 65 respondents perceived a decline in the daily use of the Nias language. Furthermore, 60 respondents reported that younger generations experience difficulties in understanding certain Nias vocabulary, particularly words originating from specific regional dialects. In addition, the majority of respondents agreed that digital media could support language learning and contribute to the preservation of regional languages. The detailed results of the respondents' perceptions are presented in Figures 1, 2, and 3.

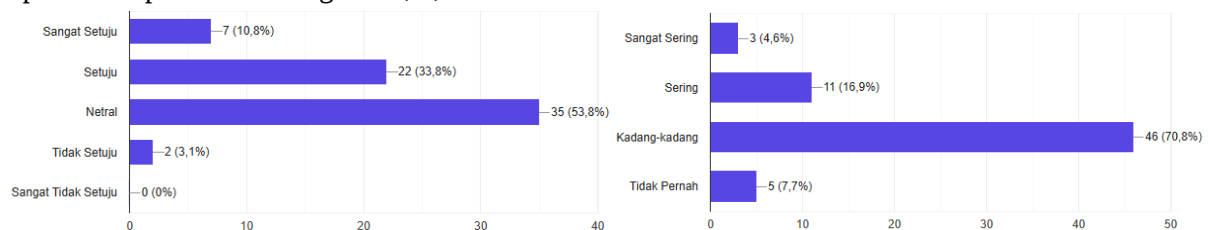


Figure 1. (a) Respondents' perceptions regarding the decreasing use of the South Nias language among younger generations; (b) Proportion of respondents reporting difficulties in comprehending South Nias vocabulary.

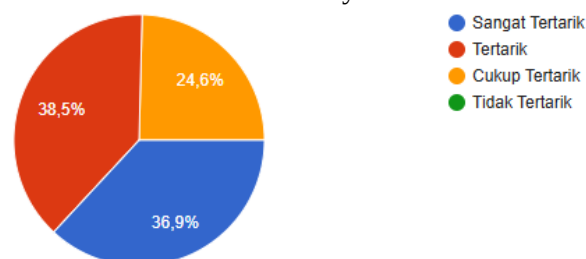


Figure 2. Respondents' interest in a web-based South Nias language dictionary system.

Based on the diagram results above, it can be observed that the use of the Nias language has begun to decline among the community, particularly among the younger generation. Although the Nias language is still used in daily communication, current preservation efforts are mostly limited to printed dictionaries, one of which is the Nias language dictionary compiled by Dr. Zagoto [8]. However, the availability of Nias language dictionaries in digital form and web-based learning media remains very limited, causing difficulties for the

community in learning vocabulary and dialect variations of the Nias language. Therefore, language preservation efforts through digitalization are urgently needed, one of which is the development of a web-based Nias language dictionary system to facilitate easier learning, understanding, and long-term preservation of the regional language [9]. Addressing this problem, this study aims to develop a web-based Nias language dictionary system as a digital learning medium and a tool for regional language preservation. The developed system is expected to assist users in searching, understanding, and learning Nias vocabulary more easily, while also supporting efforts to preserve the regional language in the digital era. In terms of system development, this study adopts the Waterfall model as the software development approach. System modeling is conducted using Unified Modeling Language (UML), which consists of use case diagrams, activity diagrams, sequence diagrams, class diagrams, and state diagrams to represent the processes and design of the web-based Nias language dictionary system.

METHOD

Research Design, Time and Place of Research

This study adopts a system development research approach aimed at developing a web-based Nias language dictionary system as a digital medium for regional language preservation. The research was conducted from February to May 2026, with a total duration of four months, covering the stages of data collection, system analysis, system design, implementation, and report writing. The study was carried out in South Nias Regency, North Sumatra Province. Data collection was conducted through questionnaires distributed to communities in several districts within South Nias Regency, including Amandraya, Aramo, Boronadu, Fanayama, Gomo, Hibala, Hiliduhu, Hilimegai, Hilisalawaahe, Huruna, Idanotae, Lahusa, Lolomatua, Lolowau, Luahagundre Maniamolo, Maniamolo, Mazino, Mazo, Oou, Onohazumba, Onolalu, Batu Islands, West Batu Islands, East Batu Islands, North Batu Islands, Siduaori, Simuk, Somambawa, Susua, Tanah Masa, Teluk Dalam, Toma, Ulu Idanotae, Ulunoyo, and Ulususua.

System Development Method

The system development method used in this study is the Waterfall model. The Waterfall model is a software development approach that is carried out in a sequential and structured manner, consisting of requirement analysis, system design, implementation, testing, and system maintenance [10]. This method was chosen because its structured phases facilitate the development process of the web-based Nias language dictionary system [11].

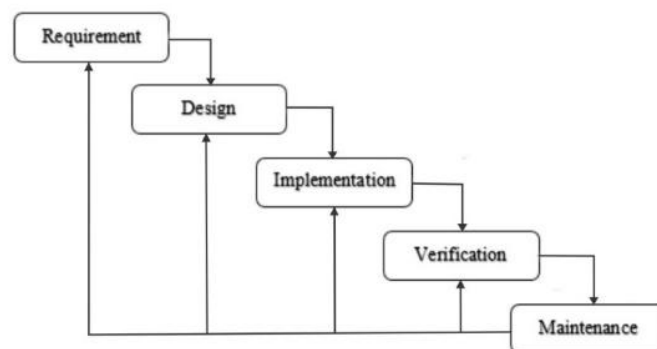


Figure 3. The Waterfall software development model

User Requirements Analysis

At this stage, system requirements were collected and analyzed through questionnaires distributed to 65 respondents, as well as a literature study based on the Nias language dictionary compiled by Dr. Zagoto. The results of this analysis were used to determine both functional and non-functional system requirements, such as vocabulary search functionality, user interface design, and ease of user access. The research instrument used in this study was a questionnaire distributed via Google Forms to obtain data related to the use of the Nias language, vocabulary comprehension, and community needs for a web-based Nias language dictionary system. The questionnaire was designed to systematically collect information from respondents in accordance with the

research objectives. The data obtained from the Google Forms questionnaire were automatically compiled into Google Sheets. Subsequently, the data were processed and analyzed, then presented in the form of diagrams (charts) to facilitate interpretation of the research findings. The results of the data analysis are presented in the figures below.

Table 1. Respondents' Demographic Characteristics

Variable	Category	Frequency (n)	Total Respondents
Gender	Male	32	65
	Female	33	
Age	15–18 years	6	65
	19–22 years	44	
	23–26 years	8	
	26–30 years	1	
	>30 years	6	
Education Level	Senior High School (SMA/SMK)	42	65
	Diploma	2	
	Bachelor's Degree	17	
	Master's Degree	3	
	Doctoral Degree	1	

Seberapa sering Anda menggunakan Bahasa Nias Selatan dalam kehidupan sehari-hari?
65 jawaban

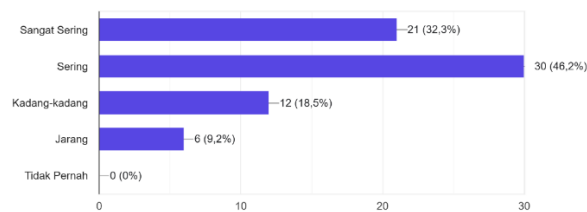
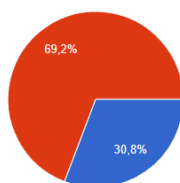


Figure 4. Respondents' self-assessment of their proficiency in the South Nias regional language.

Apakah Anda pernah menggunakan kamus digital atau aplikasi penerjemah bahasa daerah?
65 jawaban



Fitur apa yang menurut Anda penting dalam kamus digital Bahasa Nias Selatan? (Boleh memilih lebih dari satu)
65 jawaban

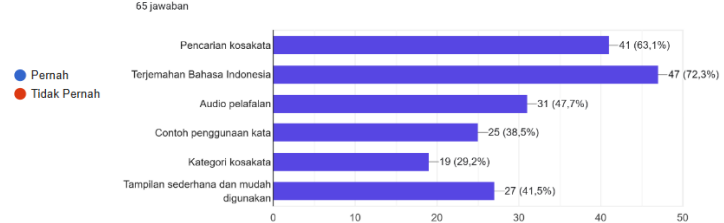


Figure 5. (a) Distribution of respondents' experience in using digital dictionaries or regional language translation applications; (b) Key features of a South Nias digital dictionary as perceived by respondents.

Based on the survey results regarding the important features of the South Nias digital dictionary, the Indonesian translation feature was identified as the most selected feature, chosen by 47 respondents. This indicates that the primary user need for a digital dictionary is the ease of understanding South Nias vocabulary meanings through Indonesian equivalents. The vocabulary search feature ranked second, selected by 41 respondents, indicating that accessibility and speed in finding words are essential aspects of digital dictionary usage. Meanwhile, the audio pronunciation feature was chosen by 31 respondents, highlighting the importance of phonetic aspects in regional language learning to provide users with accurate pronunciation models. Furthermore, the simple and user-friendly interface feature was selected by 27 respondents, while example sentence usage was chosen by 25 respondents. Both aspects indicate that ease of navigation and contextual word usage are also important considerations in digital dictionary design. The vocabulary categorization

feature received the lowest selection, with 19 respondents, although it still plays a role in organizing vocabulary based on thematic categories.

System Requirements Analysis

The system requirements analysis is divided into two categories: functional requirements analysis and non-functional requirements analysis. Functional requirements analysis is conducted to identify the essential functions that must be available in the web-based Nias language dictionary system. Based on user requirement analysis, the system has two main actors, namely the user and the administrator.

Users are able to search vocabulary, view word meanings, and access Nias language lexical information, while administrators have access rights to manage vocabulary data, including adding, editing, and deleting entries. Non-functional requirements analysis is conducted to determine the quality characteristics required for the system to operate optimally. The web-based Nias language dictionary system is designed to be accessible through various internet-connected devices, feature a user-friendly interface, provide fast search results, and ensure data security through administrator authentication. In addition, the system utilizes web technology and a database to support structured and sustainable management of Nias vocabulary.

Table 2. Functional Requirements of the System

No	Actor	Funcional Requirement
1	User	Perform vocabulary search
2	User	View search results
3	User	View vocabulary list
4	User	Access the system
5	Admin	Log in the system
6	Admin	Add vocabulary data
7	Admin	Edit vocabulary data
8	Admin	Delete vocabulary data
9	Admin	Manage vocabulary data
10	Admin	Log out of the system

Table 3. Non-Functional Requirements of the System

No	Category	Non-Funcional Requirement
1	Usability	Ease of use
2	Performance	Fast system response
3	Compatibility	Device compatibility
4	Availability	System availability
5	Security	Data security
6	Reliability	System reliability
7	Maintainability	Ease of maintenance
8	Database	Data storage

Table 4. Hardware and Software Requirements

No	Component	Minimum Specification
Hardware Requirements		
1	Processor	Intel® N100
2	RAM	8 GB
3	Penyimpanan	SSD 256 GB
4	Monitor	Resolusi 1366 × 768 piksel
5	Laptop	Acer Aspire AL14-31P
No	Software	Funcion
Software Requirements		
1	Sistem Operasi Windows 12	Development and testing platform

3	Visual Studio Code	Source code development
4	PHP	Server-side programming language
5	HTML, CSS, JavaScript	Web interface development
6	MySQL	Vocabulary database management
7	XAMPP	Local web server and database server
8	Google Chrome	System testing and access

System Design

This stage involves system design based on the results of the requirements analysis. The design is carried out using Unified Modeling Language (UML) to illustrate the processes and architecture of the web-based Nias language dictionary system. The UML diagrams used in this study include Use Case Diagrams, Activity Diagrams, Sequence Diagrams, Class Diagrams, and State Diagrams.

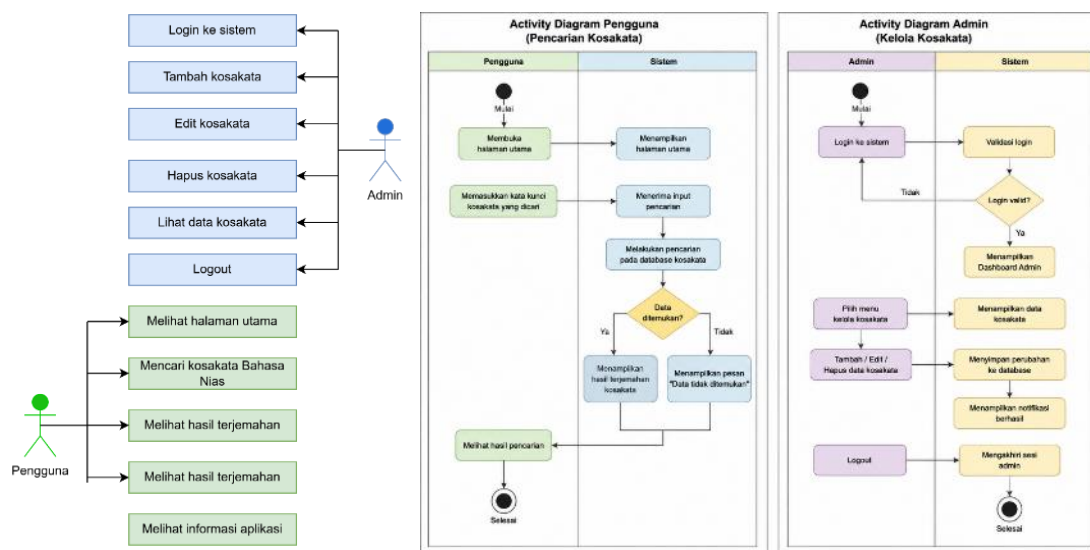


Figure 6. Use Case Diagram and Activity Diagram of the Web-Based Nias Language Dictionary System

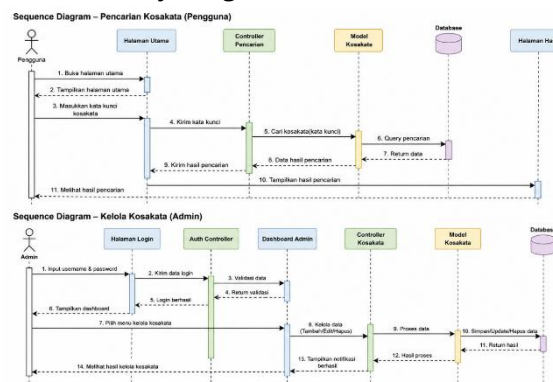


Figure 7. Sequence Diagram of the Web-Based Nias Language Dictionary System

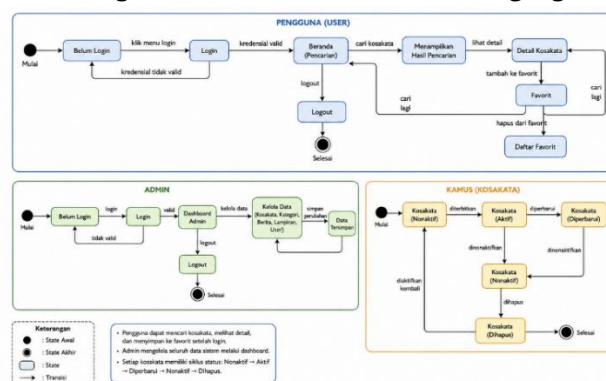


Figure 8. State Diagram of the Web-Based Nias Language Dictionary System

RESULTS

System Implementation

At the implementation stage, the system design was translated into a web-based Nias language dictionary application that can be used by both users and administrators. The system was developed using web technologies with a database to store and manage Nias vocabulary. The implementation was carried out based on the functional requirements and system design defined in the previous stage. The system consists of two types of users, namely general users and administrators. General users can search for Nias vocabulary and view word meanings and related information available in the dictionary. Administrators have access rights to manage vocabulary data through add, edit, and delete functions. The system interface was designed to be simple and user-friendly, enabling the community to access Nias language information effectively.

Home Page

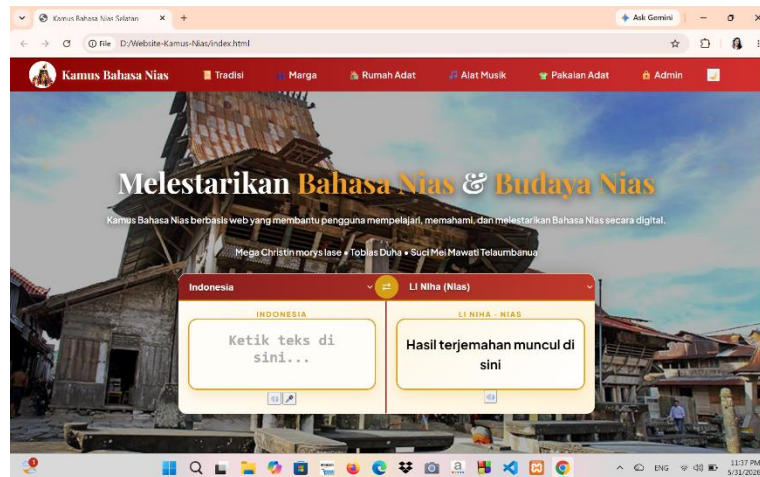


Figure 9. Home Page of the Web-Based Nias Language Dictionary System

The home page is the initial interface displayed when users access the web-based Nias language dictionary system. This page is designed as a central access point for the various features available in the system and also provides information related to the preservation of Nias language and culture. The main section of the page includes a translation feature that allows users to input Indonesian text for translation into the Nias language.

In addition to the text translation feature, the system is also equipped with a speech feature (text-to-speech) that enables users to listen to the pronunciation of the translated output. Users can enter text into the provided input box, and the system will display the translation results in the output field and provide an audio button to play the pronunciation of the translated text. This feature was developed to assist users in learning the pronunciation of Nias vocabulary in a more interactive way. The home page also provides navigation menus to access information about Nias culture, including traditions, clans, traditional houses, musical instruments, and traditional clothing.

Translation and Pronunciation Page



Figure 10. Translation and Pronunciation Page of the Web-Based Nias Dictionary System.

The translation and pronunciation page is one of the main features of the web-based Nias language dictionary system. This page allows users to input Indonesian text into the input field to be translated into the Nias language. After the translation process is executed, the system displays the translated output based on vocabulary data stored in the database. In addition to presenting translation results, this page is also equipped

with audio-based features that support the Nias language learning process. Users can utilize the speech-to-text feature to input text via voice and also use the text-to-speech feature to listen to the pronunciation of the translated output generated by the system.

Login Page

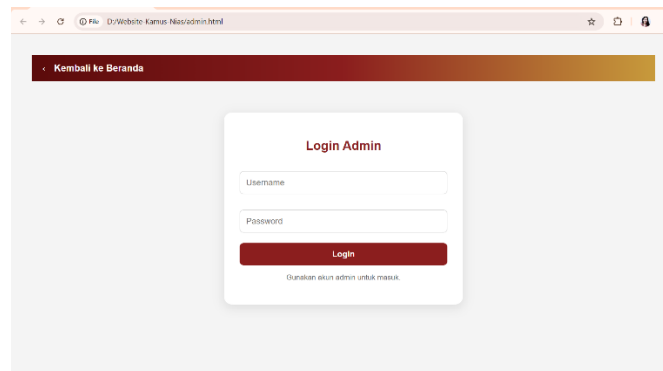


Figure 11. Login Page of the Web-Based Nias Dictionary System.

The login page is used by the administrator to access the management system of the Nias language dictionary. On this page, the administrator is required to enter a registered username and password. The authentication process is performed to ensure that only authorized users can manage the vocabulary data and information available in the system. After the login credentials are verified and found to be valid, the system redirects the administrator to the dashboard page, where various data management activities can be performed. If the entered username or password is incorrect, the system will display an error message and prompt the administrator to log in again. The login page plays an important role in maintaining system security and preventing unauthorized access to administrative features.

System Testing

System testing was conducted using the Black Box Testing method to ensure that all functions available in the web-based Nias language dictionary system operate in accordance with the specified requirements. This method focuses on testing system functionality by examining inputs and outputs without considering the internal structure of the program code. The testing was carried out on the main system features, such as the login process, language translation, audio features, and vocabulary data management by the administrator.

Table 5. Results of Black Box Testing

No	Tested Feature	Test Scenario	Expected Result	Actual Result	Status
1	Admin Login	Enter valid username and password	System displays admin dashboard	Admin dashboard successfully displayed	Valid
2	Admin Login	Enter incorrect username or password	System displays error message	Error message successfully displayed	Valid
3	Language Translation	Input Indonesian text	System displays Nias language translation	Translation result successfully displayed	Valid
4	Speech-to-Text	Input voice via microphone	System converts speech into text	Speech successfully converted into text	Valid

5	Text-to-Speech	Press audio button on translation result	System plays pronunciation audio	Audio successfully played	Valid
6	Add Vocabulary	Add new vocabulary data	Data is stored in the database	Data successfully stored	Valid
7	Edit Vocabulary	Modify existing vocabulary data	Data is updated in the database	Data successfully updated	Valid
8	Delete Vocabulary	Delete vocabulary data	Data is removed from database	Data successfully deleted	Valid
9	Vocabulary Search	Enter search keyword	System displays relevant data	Data successfully displayed	Valid
10	Logout	Click logout button	System logs out from admin page	Logout successfully performed	Valid

DISCUSSION

The findings of this study indicate that the web-based Nias language dictionary system successfully provides a digital platform for documenting and accessing Nias vocabulary in a more accessible manner. Based on the implementation and testing results, all main system functions performed well, including translation, vocabulary search, speech-to-text, text-to-speech, and vocabulary management by the administrator. These findings demonstrate that information technology can be utilized as a supporting medium for regional language preservation through the digitalization of vocabulary and the provision of broader access to the community.

Based on the questionnaire results involving 65 respondents, 85% of participants stated that the digital dictionary helped improve their understanding of vocabulary. This finding indicates that web-based technology can enhance the accessibility of regional language learning. This result is consistent with the digital learning theory proposed by Richard E. Mayer, which states that digital media can improve learning effectiveness by presenting information in an accessible and interactive manner [12]. The results also support previous studies that found digitalization of regional languages contributes to language preservation and increases young people's interest in learning local languages and cultures.

In addition to providing vocabulary search and translation features, the developed system is also equipped with speech-to-text and text-to-speech functionalities. These features allow users not only to obtain word meanings but also to learn pronunciation interactively. The findings support the concept of digital preservation, which emphasizes the importance of digital technology in documenting and preserving cultural heritage, including regional languages. With a web-based system that can be accessed anytime and from various devices, the preservation of the Nias language becomes more adaptable to technological developments and modern societal needs.

CONCLUSION

This study successfully developed a web-based Nias language dictionary system as a digital medium supporting the preservation of the Nias language. The system was developed using the Waterfall method, consisting of requirement analysis, system design, implementation, and testing stages. Black Box Testing results showed that all system features, including vocabulary translation, word search, speech-to-text, text-to-speech, and vocabulary management by the administrator, function properly in accordance with the specified

requirements. Based on the questionnaire results involving 65 respondents, 85% stated that the use of the digital dictionary helped them understand Nias vocabulary. This finding indicates that web-based technology can improve the accessibility of regional language learning while supporting efforts to preserve the Nias language in the digital era. In addition to facilitating vocabulary search and translation, the system also assists users in learning pronunciation through the available audio features.

The novelty of this study lies in the development of a web-based Nias language dictionary system that integrates translation, speech-to-text, and text-to-speech features within a single platform. This integration makes the system function not only as a digital dictionary but also as an interactive learning medium that helps users understand vocabulary and pronunciation more effectively.

For future development, it is recommended to increase the vocabulary database and develop a dialect-based speech feature that allows users to listen to word pronunciations according to regional variations. This feature is important considering that the Nias language has differences in pronunciation and vocabulary across several regions, such as South Nias, North Nias, West Nias, and Gunungsitoli City. With dialect selection capabilities, users will not only understand word meanings but also learn pronunciation specific to each regional linguistic characteristic. This enhancement is expected to strengthen the system as a learning medium and support the preservation of Nias dialect diversity as part of the regional cultural heritage.

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