



Faculty of Computer Science and Information Technology

***HARNESSING DIGITAL ARCHIVES FOR THE
CONSERVATION OF SARAWAK'S MUKUN PANTUN***

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Bachelor of Computer Science with Honours (Information System)

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SARAWAK'S MUKUN PANTUN**

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This project is submitted in partial fulfilment of the requirements for the degree of Bachelor
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**PEMANFAATAN ARKIB DIGITAL UNTUK PEMULIHARAAN
PANTUN MUKUN SARAWAK**

MUHAMAD AUDI BIN PASHA

Projek ini merupakan salah satu keperluan untuk Ijazah Sarjana Muda Sains Komputer
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2025

DECLARATION

I hereby declare that this project is my original work. I have not copied from any other student's work or from any other sources except where due reference or acknowledgement is not made explicitly in the text, nor has any part had been written for me by another person.



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ABSTRACT

The project ‘Harnessing Digital Archives for the Conservation of Sarawak’s Mukun Pantun’ seeks to salvage the dwindling practice of Mukun pantun, a genre of Sarawak Malay poetry that has been closely linked to the culture of Sarawak. This initiative will help tackle the diminishing accessibility and receding practice by developing a sleek and engaging digital resource that aims to serve as a one stop repository of Mukun pantun. The project undertook a systematic approach in which data was gathered from an array of sources, namely social networks and manuscripts, which was subsequently cleaned, sorted, and standardized for future reference. The web-based platform enables pantun lovers, new learners to seek, share, and compose pantun, presenting the content in a visually engaging format that appeals to users. This platform also enables the new pantun to be automated classified based on 11 themes and can generate the reply pantun based on simple recommender technique. Usability Acceptance Testing (UAT) and System Usability Testing (SUS) tests were employed to help ascertain that the system meets its objectives in terms of efficiency and ease of use. It sheds light on the need to adopt modern ways to preserve this local cultural heritage and allows younger individuals to cultivate and learn Sarawak mukun pantun.

ABSTRAK

Projek Pemanfaatan Arkib Digital untuk Pemeliharaan Pantun Mukun Sarawak ini bertujuan untuk menyelamatkan amalan pantun Mukun yang semakin berkurangan, iaitu sejenis puisi Melayu Sarawak yang berkait rapat dengan budaya Sarawak. Inisiatif ini akan membantu menangani ketersediaan yang semakin berkurangan dan amalan yang menguncup dengan membangunkan sumber digital yang kemas dan menarik, yang bertujuan untuk berfungsi sebagai repositori sehati pantun Mukun. Projek ini melaksanakan pendekatan sistematik di mana data dikumpulkan daripada pelbagai sumber, iaitu rangkaian sosial dan manuskrip, yang kemudiannya dibersihkan, diisih, dan diseragamkan untuk rujukan masa hadapan. Platform berasaskan web ini membolehkan pencinta pantun dan pelajar baharu mencari, berkongsi, dan mencipta pantun, dengan menyajikan kandungan dalam format visual yang menarik minat pengguna. Platform ini juga membolehkan pantun baharu dikelaskan secara automatik berdasarkan 11 tema dan dapat menjana pantun balasan berdasarkan teknik pengesyor ringkas. Ujian Penerimaan Kebolegunaan (UAT) dan Ujian Kebolegunaan Sistem (SUS) telah digunakan untuk membantu memastikan sistem mencapai objektifnya dari segi kecekapan dan kemudahan penggunaan. Ia memberi pencerahan tentang keperluan untuk mengguna pakai cara moden untuk memelihara warisan budaya tempatan ini dan membolehkan individu yang lebih muda memupuk dan mempelajari pantun Mukun Sarawak.

Chapter 1: Introduction

1.1 Introduction

Mukun, an integral part of Sarawak's cultural heritage, is a form of poetic exchange (pantun) that is rapidly declining in practice due to limited accessibility and awareness (Norrlatep, 2018). Even though Mukun content is available on many social media platforms, there is a lack of one true source of digital repository that can be used as a reliable source for future reference. Such a noticeable absence of a dedicated platform complicates the comprehension and the practice of many Sarawakian especially for the younger generations in learning bermukun pantun and its structure. This structural feature is pivotal for understanding Mukun as a cultural form.

Research suggests that cultural art forms should be preserved through digital platforms since they promote better understanding and accessibility (Portalés et al., 2018). As the level of digital interaction increases, the urge to preserve and digitize cultural resources escalates to ensure future generations have access. An inclusive and easy-to-use platform can enhance audience engagement with traditional forms of art, especially children and youth who have become reliant on technology for learning (Portalés et al., 2018).

To address these challenges, this project suggests utilizing digital technology by developing an online platform that archives Mukun pantuns from multiple online sources, which is aimed to lessen such challenges. This consists of data cleaning and data profiling. Besides that, users will be able to search for certain pantun or browse through the entire repository, find the suitable replies, and even contribute more pantun themselves, therefore, aiding in the sustenance and revitalization of the Mukun tradition. This project seeks to improve cultural appreciation and participation through digital technology, which will guarantee that the magnificent work of Mukun remains relevant and appealing to the next generations.

This project involves collecting and digitizing Mukun pantun from sources such as YouTube, websites, and social media and perform data cleaning as well as data profiling. The retrieved Mukun pantun will be stored into a searchable database that is linked to the website where users are able to search, explore, and find appropriate response to a specific pantun. The website will also be tested on User Acceptance Testing (UAT) and System Usability Scale (SUS) in terms of its usability specifically on user-friendliness on the website. This is to ensure proper cultural engagement.

1.2 Problem Statement

Mukun pantun, a form of Sarawak Malay poetry, is at the brink of being lost as no means have been ever developed to store it in a digital format. A limited approach in regard to making Mukun pantun available makes learners' engagement complicated as a centralized digital resource does not exist. Even as it currently stands, where content can be found on various channels including YouTube, social media, and websites, it is difficult for users to comprehend and appreciate genuine Mukun pantun. Most of the content available online is scattered across different platforms, and some are mixed with other types of pantuns, making it harder to identify authentic Mukun pantun. Studies on cultural preservation indicate that digital technologies are essential in supporting the conservation of cultural heritage by providing innovative tools and methods that improve efforts in documentation, preservation, and sharing (Siliutina et al., 2024). Additionally, user-friendly digital platforms can help bridge cultural knowledge gaps, making it easier to appreciate and learn traditional art forms (Siliutina et al., 2024). In order to preserve Mukun pantun's cultural relevance, increasing its accessibility and foster understanding through technology, this project aims a centralized digital platform for Mukun pantun.

1.3 Scope

This project offers a web-based application that can be accessed from any device with an internet connection. The website contains Mukun pantun collected from YouTube, the web, and social media and offered in a searchable database enabling users to look for relevant answers to specific pantun as well as contributing new pantuns. The primary audience includes individuals interested in learning or preserving the Mukun tradition, particularly young adults and cultural enthusiasts. The platform will be designed for ease of use and will include options for users to contribute additional pantun entries, helping expand the collection. Usability testing will be conducted at the testing stage to ensure the platform's effectiveness and user-friendliness.

1.4 Aims and Objectives

The objectives of this project include:

1. To collect and digitize Sarawak's Mukun poetry (pantun) from online sources, including YouTube, websites, or social media platforms.
2. To design a web-based platform for digital archiving the Mukun pantun.
3. To evaluate the proposed digital archives based on user acceptance test and usability test.

1.5 Project Significance

This project will aid in conserving and making more accessible the Mukun pantun, a traditional art form of Sarawak Malay. By developing a web-based application solution, this project solves the problem of segregated and inaccessible Mukun content and promotes a deeper understanding of the culture, especially for younger audiences. This website may assist students in grasping the components and concept of Mukun pantun, therefore linking them to the history of Sarawak, and reinforcing the essence of the culture. Furthermore, permitting the users to put their own pantun submissions aids in building an ever changing, participatory collection that keeps the pantun alive.

1.6 Thesis Organization

This thesis is structured into six chapters, each contributing to the systematic development and evaluation of a digital archive for the conservation of Sarawak's Mukun pantun.

Chapter 1: Introduction

This chapter introduces the project and establishes its purpose by discussing the research background, highlighting the significance of preserving Mukun pantun through digital archiving. It defines the problem statement, emphasizing the challenges and gaps in the current preservation methods. The research objectives, scope, and limitations are outlined to clarify the project's focus and direction. Additionally, the chapter discusses the importance of the project in contributing to cultural preservation and includes the expected project outcomes and schedule to provide an overview of the proposed timeline.

Chapter 2: Literature Review

This chapter presents an in-depth review of relevant theories, concepts, and previous studies that form the basis for the research. The review covers the traditional art of Mukun pantun, its historical and cultural significance, and existing practices for preserving pantun. Digital archiving concepts and techniques are also explored, along with examples of similar projects in cultural preservation. The chapter concludes by identifying research gaps and highlighting how the proposed project addresses these gaps, offering new insights into digital archiving and the conservation of intangible heritage.

Chapter 3: Methodology

This chapter explains the systematic approach used to conduct the research. It describes the stages of data collection, including identifying sources such as books, manuscripts, and online platforms, as well as the procedures for ensuring the quality and reliability of the collected data. The methodology for data cleaning and profiling is detailed, with steps to standardize the pantun structure and categorize it into thematic groups. The development of the digital archive follows the Waterfall model, and this chapter elaborates on each phase of the model, from system design to implementation and evaluation. The rationale for using this methodology is also discussed, ensuring clarity and alignment with the project objectives.

Chapter 4: Implementation

This chapter details the implementation phase of the project. It begins by outlining the technical environment used to support development, including software tools such as XAMPP, phpMyAdmin, and Visual Studio Code. The chapter then explains the system architecture and user roles, distinguishing between public users, registered contributors, and administrators. Each user role is described in relation to its specific access and functionalities within the system. Key platform features such as registration, login, browsing, uploading, and searching pantun are elaborated with corresponding design considerations. Additionally, the chapter addresses administrative controls such as content approval, user management, and database handling. Through detailed discussion of the interface and logic behind each function, this chapter explains how the platform's structure supports its objective of being a comprehensive, user-friendly, and culturally responsive digital archive.

Chapter 5: System Evaluation

This chapter presents the evaluation of the developed system with a focus on its usability, reliability, and overall user satisfaction. The evaluation process is conducted using two primary approaches, User Acceptance Testing (UAT) and the System Usability Scale (SUS). The chapter covers the evaluation objectives and metrics, focusing on the effectiveness of navigation, pantun categorization, and responsiveness. Aside from that, it describes the participant demographics and the testing scenarios employed during the User Acceptance Testing (UAT) phase. This section provides insights into user interactions with the platform and the feedback received. It continues with an in-depth discussion of SUS results, analysing individual responses to each questionnaire item and calculating the overall usability score. User feedback is also examined to identify strengths and areas for improvement. The evaluation findings validate the platform's effectiveness in achieving its intended goals and highlight specific aspects that enhanced user engagement and experience.

Chapter 6: Conclusion and Future Works

This chapter concludes the thesis by summarizing the project's achievements, identifying limitations, and proposing directions for future development to enhance the platform's role in cultural preservation.

1.7 Project Schedule

The development of the project mainly depends on the use of a precise project schedule. The identifying of the project milestone serves as a guideline for determining whether or not the project can be completed on time. Table 1 below shows the project timeline for the FYP project which consist of Chapter 1, Chapter 2, Chapter 3, Chapter 4, Chapter 5, and Chapter 6 timelines.

Table 1.
FYP 1 Project Schedule

Task Name	Duration (Days)	Start	Finish
1.Brief Proposal	8	14/10/24	20/10/24
1.1 Discussion and discussing topic with Supervisor.	5	14/10/24	18/10/24
1.2 Define and identify proposed project	1	18/10/24	18/10/24

1.3 Amendments on brief proposal after review	2	19/10/24	19/10/24
1.4 Submission of brief proposal	0	20/10/24	20/10/24
2. Full Project Proposal	16	21/10/24	14/11/24
2.1 Defining methodology and scope	7	28/10/24	4/11/24
2.2 Submit draft for supervisor review	5	4/11/24	8/11/24
2.3 Amendments on full proposal	4	11/11/24	14/11/24
2.4 Submission of full proposal	0	14/11/24	14/11/24
3. Chapter 1: Introduction	9	14/11/24	21/11/24
3.1 Improve full proposal	5	14/11/24	18/11/24
3.2 Submit draft for supervisor review	1	18/11/24	18/11/24
3.3 Amendments on Chapter 1	3	18/11/24	21/11/24
3.4 Submission of Chapter 1	0	21/11/24	21/11/24
4. Chapter 2: Literature Review	19	21/11/24	13/12/24
4.1 Research and gather relevant sources on Mukun pantun and cultural preservation.	5	21/11/24	25/11/24
4.2 Analyse existing platforms for cultural preservation.	5	26/11/24	30/11/24
4.3 Review and summarize studies on digital platforms for cultural preservation	4	1/12/24	4/12/24
4.4 Synthesize findings to identify gaps in Mukun digital preservation	5	5/12/24	12/12/24
4.5 Submission of Chapter 2	0	13/12/24	13/12/24
5. Chapter 3: Requirement Analysis and Design	23	13/12/24	5/1/25
5.1 Gather user requirements	5	13/12/24	17/12/24
5.2 Define functional and non-functional requirements	7	18/12/24	24/12/24
5.3 Create initial system architecture & design	7	25/12/24	21/12/24
5.4 Develop wireframes and user interface prototypes	4	1/1/25	4/1/25
5.5 Submission of Chapter 3	0	5/1/25	5/1/25
6. Chapter 4: Implementation	53	3/3/25	15/5/25
6.1 Develop core functionalities	20	3/3/25	28/3/25
6.2 Integrate and test system modules	15	31/3/25	18/4/25
6.3 Debug, refine, and prepare submission	17	21/4/25	14/5/25
6.4 Submission of Chapter 4	0	15/5/25	15/5/25
7. Chapter 5: System Evaluation	15	16/5/25	3/6/25
7.1 Define evaluation metrics	4	16/5/25	21/5/25
7.2 Conduct user testing and feedback	6	22/5/25	29/5/25
7.3 Analyse results and refine report	4	30/5/25	3/6/25
7.4 Submission of Chapter 5	0	3/6/25	3/6/25
8. Chapter 6: Conclusion & Future Works	12	4/6/25	18/6/25
8.1 Draft conclusion and future plans	7	4/6/25	11/6/25
8.2 Final edits and review	6	12/6/25	17/6/25
8.3 Submission of Chapter 6	0	18/6/25	18/6/25

1.8 Expected Outcome

At the end of this project, we expected a functional web-based platform is developed for exploring and engaging with Mukun Pantun.

Chapter 2: Literature Review

2.1 Introduction

This chapter discusses and examines three existing systems relevant to the safeguarding of Mukun Pantun. In order to put this analysis into context, more articles, journals, and conference papers are cited, giving a complete basis for understanding how Mukun Pantun has been and will be safeguarded. As a result of this review, it will be clear on how the system presented in the research is novel and, therefore, necessary for the purposes of the digital preservation of cultural heritage.

The digital system described in Chapter 1 is a digital repository developed specifically for the salvaging of Sarawak's Mukun Pantun. As pointed out by Zainab Ajab Mohideen and Kaur's (2015), digital libraries are an advanced category of libraries which are focused on or manage specific collections of digital objects, including text, image, video, and audio in electronic forms. Not only do such systems guarantee the survival of important cultural treasures, but they also offer a medium for the users to interact with and appreciate their cultural artifacts.

This chapter is structured into several key sections which includes an exploration of the concept of pantun (poetry), definition of cultural heritage, an introduction to Mukun Culture, the role of digital archives in cultural preservation, digital profiling, challenges in digital preservation, and a review of existing systems. These sections aim to identify research gaps, provide a clearer understanding of the current landscape, and highlight how this study contributes to bridging those gaps, thereby reinforcing the importance of preserving Sarawak's rich cultural heritage for future generations.

2.2 Cultural Heritage

Heritage includes a variety of components such as monuments, buildings, artifacts, collections, sites, and museums which have a specific or several meanings including historic, ethnological, social, artistic, etc (Portalés et al., 2018). Heritage involves a value system of sets of components which primarily involve monuments, artistic works, buildings and landscapes, and this value system has been developing through up the historical growth of these elements

over time (Portalés et al., 2018). There was a pronounced evolution in the particular value placed on these monuments and structures as they were systematically obliterated or lost and the conclusiveness established that they possess outstanding universal value that belong to the entire humankind. At the same time the focus on the cultural values contained in the term heritage tends to stress its fragility in the face of changing times. This growth of the perspective in question is squarely located in the frameworks of conservation and protectionist ideology (Portalés et al., 2018).

2.3 Sarawak Mukun: A Cultural Treasure of Sarawak

Sarawak's rich oral heritage is embodied in Mukun Pantun as it combines poetry, music and performance (The Borneo Post, 2015). Its importance is on building up community ties and those of cultural identification but it suffers from the decreasing number of practitioners and absence of thorough account (The Borneo Post, 2015). This research intends to use technology to collect and showcase the art form so that it does not become extinct for the coming generations.

The Mukun pantun is a lively traditional art form which is one of the cultures of the Malay people of Borneo, especially Sarawak (The Borneo Post, 2015). In this sense, it has become animating theatre because the dances, drumming and the recitation and the responses in the form of pantun hamper the loss of the attention of the audience (The Borneo Post, 2015). Historically, bermukun was practiced as a form of entertainment in village wedding parties and engaged young people to mingle and possibly court (Bermukun Culture Should Be Preserved - Sarawak Premier, 2024). It is characterized by Mak Gendang, essentially rangoli of Malaysian female party representatives, in accompaniment of rhythmic drumming, poetry is recited and sometimes some innuendos are discussed (Bermukun Culture Should Be Preserved - Sarawak Premier, 2024).

A traditional Mukun performance includes various roles such as female percussionists (*Seh Gendang*), a male violinist, and male dancers performing the Malay *tandak* dance (*The Borneo Post*, 2015). The performers engage in a poetic dialogue by asking and responding through pantun, delivered melodically during the performance (*The Borneo Post*, 2015). According to the data collected, this cultural practice has had far reaching effects on the neighbouring societies specifically the Iban Dayaks who now practice it in regions such as

Samarahan and Simunjan and with the long history and close relationship that such communities shared, the practice became integrated into their communities (The Borneo Post, 2015).

The main goal of Mukun was rather historical and popular in the ancient times but now seems to be endangered of extinction because of the changes brought about by civilization and the lapse of traditional beliefs and ways of life (The Borneo Post, 2015). When speaking of these cultural assets, the head of Sarawak put an emphasis on the need to protect the Bermukun tradition as an invaluable part of the history of Sarawak and so there is a need to focus on ways of preserving and enhancing this cultural asset (The Borneo Post, 2015).

2.4 Concept of Pantun

Pantun, as a form of poetry, is characterized by its structured composition, rhythmic patterns, and profound meanings, reflecting its high artistic value (Wang et al., 2009). The concise and compact language of poetry makes it challenging to accurately translate and convey its original essence to non-native audiences, allowing them to experience it as native readers do. Poetry translation is widely acknowledged as a complex and intricate process. Over the course of more than 2,000 years, translators and scholars have developed numerous translation principles from diverse perspectives through extensive practice, aiming to achieve optimal outcomes (Wang et al., 2009).

Definition and Structure

Pantun, a form of traditional Malay poetry, is constructed using a pairing of lines known as *baris* or *kerat* (Bartosh et al., 2023). The most basic pantun consists of two lines (*pantun 2 kerat*), while more elaborate structures include four lines (*pantun 4 kerat*) or more (Bartosh et al., 2023). Each stanza is crafted with a pairing principle that dictates the relationship between the *pembayang* (introductory lines) and the *maksud* (main lines) (Bartosh et al., 2023). Every *pembayang* line must correspond to a *maksud* line, resulting in an even number of lines in any pantun structure (Bartosh et al., 2023).

Pairing and Ordering Rules

The arrangement of *pembayang* and *maksud* follows strict conventions (Bartosh et al., 2023). All *pembayang* lines precede the *maksud* lines within the stanza (Bartosh et al., 2023). For instance, in a *pantun 4 kerat*, the sequence is as follows:

- **Line 1:** *Pembayang 1*
- **Line 2:** *Pembayang 2*
- **Line 3:** *Maksud 1*
- **Line 4:** *Maksud 2*

Ensure that the **pembayang** (introductory lines) always precede the **maksud** (meaningful lines) in the proper sequence. If there are two lines of **pembayang** and two lines of **maksud**, they should form two distinct pairs. The pairs must maintain their order within their respective sections and should not be mixed up.

Considering this structure, the concept of *pantun 3 kerat* (a stanza with three lines) may seem odd. Since three is an uneven number, it becomes impossible to create proper pairings between **pembayang** and **maksud**, as the pairing mechanism relies on having an even number of lines. This sequence ensures the logical flow and structural integrity of the pantun. Improper ordering, such as interchanging or misaligning *pembayang* and *maksud*, disrupts the intended meaning and poetic rhythm. The pairings are often connected through rhyme, enhancing the cohesiveness of the composition.

Incorrect Pairing

An incorrect sequence of a pantun and it should not be followed:

- **Line 1:** *Pembayang 1*
- **Line 2:** *Maksud 1*
- **Line 3:** *Pembayang 2*
- **Line 4:** *Maksud 2*

Rhyming Scheme and Variations

Pantun is celebrated for its rhyme schemes, with the most common being ‘*abab*’ in four-line stanzas (Bartosh et al., 2023). In this arrangement:

- The first line rhymes with the third line.
- The second line rhymes with the fourth line.

According to Bartosh et al. (2023), this arrangement of a *pantun 4 kerat* can be seen as follows:

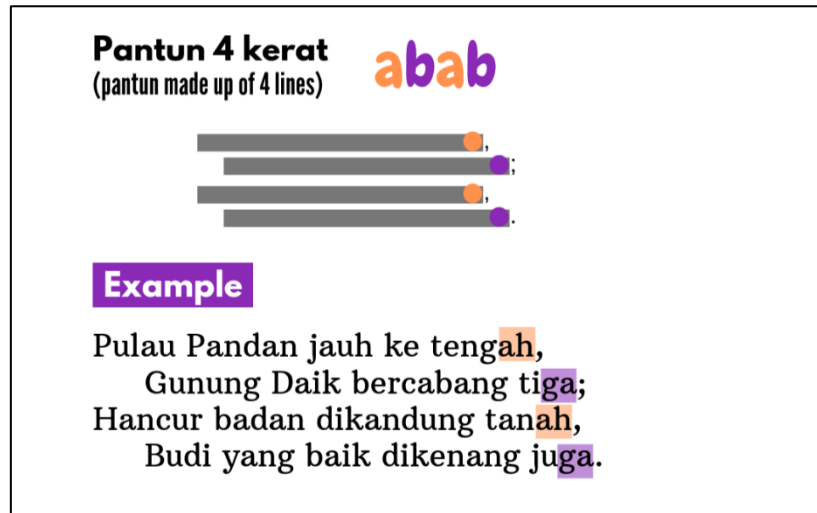


Figure 1. Rhyming Scheme

Note: The pairing of **pembayang** and **maksud** is established by using the same rhyme at the end of their lines.

This rhyme pattern contributes to the aesthetic and rhythmic appeal of pantun (Bartosh et al., 2023). Additionally, the pairing principle implies that pantun must consist of an even number of lines, starting from the simplest form, *pantun 2 kerat*, or couplets. This format comprises one *pembayang* line and one *maksud* line.

Popular Forms and Terminology

Among the various types of pantuns, the *pantun 4 kerat* is the most widely recognized and popular form. It consists of two *pembayang* lines followed by two *maksud* lines, forming a quatrain. In some instances, pantun with more extensive line counts is constructed, but the foundational principle of pairing remains consistent.

According to Pantunandstuffs (2019), the general formulation for Pantun N Kerat is:

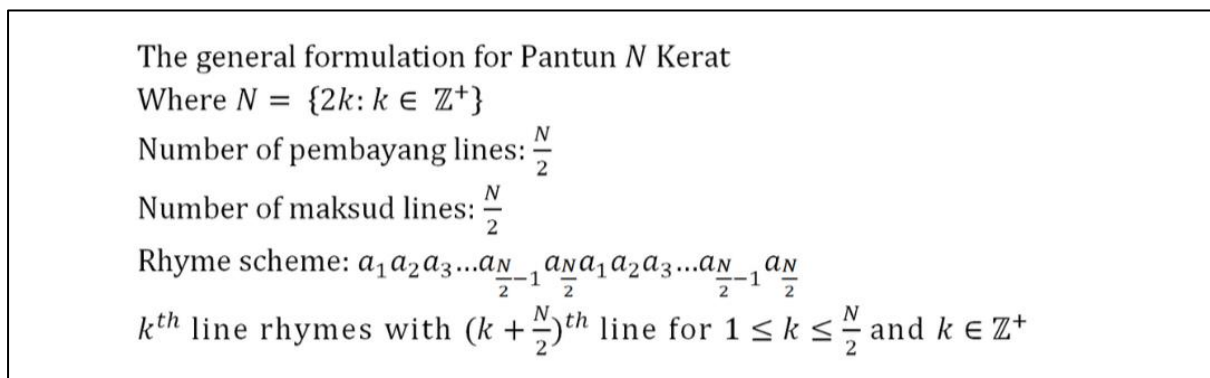


Figure 2. General Formula for Pantun N Kerat

According to the general formulation shown in Figure 2, if one were to hypothetically create a *pantun 100 kerat*, then, here is the formula:

$N = 100$ Number of pembayang lines: $\frac{100}{2} = 50$ Number of maksud lines: $\frac{100}{2} = 50$ Rhyme scheme: $a_1 a_2 a_3 \dots a_{49} a_{50} a_1 a_2 a_3 \dots a_{49} a_{50}$ Examples: 10th line will rhymes with $(10 + \frac{100}{2})^{th}$ line i.e. 60th line 34th line will rhymes with $(34 + \frac{100}{2})^{th}$ line i.e. 84th line

Figure 3. General Formula for Pantun 100 Kerat

By adhering to these traditional guidelines, pantun maintains its status as a highly valued and enduring form of Malay poetry, reflecting both cultural identity and artistic sophistication. This art form of pantuns not only showcases the creativity and linguistic depth of the Malay culture but it also acts as a bridge connecting generations through shared heritage and traditions.

2.5 The Role of Digital Archives in Cultural Preservation

The digitalization strategy aims at creating an orderly and uniform approach centred on making it easier to access and create form of artifacts, while at the same time preserving and sharing their culture. Features such as searchability, accessibility and preservation of objects make them crucial in the safeguarding of elements of culture such as the Mukun Pantun. Some of the activities done towards the safeguarding of the oral traditions of Sarawak provide useful lessons in designing an appropriate framework.

Numerous researchers across the globe have access to almost limitless resources thanks to digital archives through which assist cultural practitioners and researchers in the seamless sharing and retrieval of information around different electronic media. As pointed out by Li-Yi et al (2008), the development of websites for the purpose of facilitating the archiving of materials has made it easier for researchers to furnish historical items, and information has come to be locating rather than searching, however, even in the absence of a computer, the internet enables viewers to access images of the items literally from any part of the world. As

also pointed out by Li-Yi et al. (2008), the application of digital archives is wide revolving around the film, culture, communication and telecommunication industry.

The digital technologies devised the means of creating electronic versions of physical collections and integrated these with basic metadata about the condition, materials and formats as well as textual descriptions. This, according to Wen et al. (2012) enables the users to see the whole collection.

2.6 The Challenges of Digital Archives in Cultural Preservation

Challenges such as technical limitations, cultural sensitivity, copyrights, and the need for community involvement highlight the complexities of digitizing intangible heritage. Addressing these issues is essential for the successful implementation of the Mukun Pantun digital archive. According to Siliutina et al. (2024), here are some challenges in digital archive:

Table 2.
Challenges in Digital Preservation

Challenges	Description
Copyright and Intellectual Property Issues	The reproduction and distribution of cultural artifacts digitally often involve intricate copyright and intellectual property challenges. Balancing the protection of creator's rights with broader public access to cultural heritage remains a persistent issue.
Data Security and Privacy Concerns	Digitizing cultural heritage raises concerns about sensitive information security. Preventing unauthorized access, data breaches, and cyber threats is crucial to maintaining trust and safeguarding integrity.
Resource Constraints	The preservation of digital heritage demands considerable financial and human resources. Institutions, especially smaller ones, may face difficulties in allocating sufficient funding and expertise for these initiatives.
Standards and Interoperability	The absence of standard practices for digitization and metadata creation limits compatibility across cultural heritage databases. Adopting common standards is essential for seamless integration and data sharing.
Digital Conservation and Restoration Challenges	Unlike physical artifacts, digital materials require continuous efforts to prevent deterioration caused by software dependency or technical failures. New restoration methods need to be devised for long-term access and sustainability.
Ethical Considerations	Preservation efforts must address ethical issues, such as the cultural sensitivity of materials and the involvement of

	communities in decision making processes to avoid misrepresentation.
Cultural Sensitivity and Representation	Digitization should ensure accurate representation to avoid the distortion of misappropriation of cultural narratives. Respecting the voices of origin communities is key throughout the process.
Global Collaboration and Coordination	Effective preservation requires international collaboration, including sharing best practices and coordinated efforts. Addressing challenges on a global scale is vital for ensuring comprehensive preservation.

2.7 Data Profiling

Data Profiling definition simply means that there are processes of reviewing, inspecting and summarising a dataset with the aim of understanding the data's frame structure, content and quality (Sakdas, 2023). This process is very critical in defining the nature of the data and ensuring that it is suitable for further analysis and use. Efficient data profiling tools and techniques identify inconsistency, redundancies and incomplete data which make it easier to make decisions regarding data-driven projects (Kandel et al., 2011; Hellerstein, 2008).

Sakdas K et al. (2023) states that one of the objectives of data profiling is to improve data quality. Furthermore, the work discusses other important issues such as identifying trends and outliers in the data set that ensure that the data is reliable and trustworthy for any analytical task. The authors recommend other automatic means to improve productivity and scaling during data profiling operations, such as Python package. Such instruments provide the user the ability to thoroughly review the datasets by performing the task of detecting missing values, duplicates and outliers automatically (Abedjan et al., 2015; Müller & Hegner, 2014).

The paper further stresses the importance of profiling data to assess data quality. According to Sakdas et al. (2023), embedding profiling into the initial phases of the data analytic process improves the quality of the analysis and the use of data. These methods also enable assessment of data fairness, correctness and uniformity through the use of aggregated statistical measures. This is also stated in the work of Kim et al. (2003) who stated that profiling enhances the quality of subsequent analyses, and Chen et al.

Besides, the authors comment on necessity of geospatial data visualization in data profiling such graphics, as histograms and box plots, serve to spot errors, as well as convey information to stakeholders in an understandable manner (Sakdas et al., 2023). They assist in

blending the rhetorical analysis and practical analysis of the dataset so that both types of audiences are able to understand the dataset (Kandel et al., 2012; Heer et al., 2008).

To sum up, data profiling is an important phase in the entire data preparation process. The approaches and checklists posted by Sakdas et al. (2023) demonstrate the potential of automating and visualizing data profiling operations in order to attain better and faster evaluations of dataset quality.

2.7.1 Pantun Classification

The process of pantun classification seeks to comprehend the nature of its different types, features as well as themes. It has been noted by Nur et al. (2023) that pantun literature can be divided into genres on the basis of its form and structures, themes and language features. This in turn assists in interpreting its artistic and cultural relevance, which calls for conservation and appreciation in modern times.

According to Nur et al. (2023), one stanza of pantun generally comprises of four lines characterised by (A-B-A-B) rhyme. This structure determines the classification of pantun since any change in its rhyme scheme, length, or arrangement of stanzas can suggest a different type of pantun such as love pantun, nature pantun, and advisory pantun. *Pembayang* are the first two lines of the uncovering and imagery parts and *maksud* are the last two lines that portray the real message.

Theme-based classification of pantun aids in explaining the need and usage of the pantun. For example, pantun cinta (pantun love) may convey feelings of affection, longing or adoration, while pantun nusantara (Pantun nature) unit the nature with a multilingual mosaic expressing human experience or certain moral values (Nur et al., 2023). Additionally, pantun outlining wisdom, ethics, or counsel are referred to as pantun nasihat and such form of pantun is culturally, an educative and moral corrective tool.

It should also be noted that pantun is diverse because of its various forms and themes. Additionally, these variations make it possible to understand its cultural and regional characteristics enabling the pantun researcher to follow its history and change with time (Nur et al., 2023). The classification of Malay Pantun can be done in different ways such as their audience, form and theme (Nur et al., 2023). According to Nur et al. (2023), the rhymes can

be classified into three groups with respect to the age which are children's rhymes, youth rhymes, and parent rhymes. Form-wise, pantun can take the shapes of two, four-, six-, eight- and sixteen-line structures. Theme-based classification includes love rhymes, religious rhymes, traditional rhymes, educational or advisory rhymes, etc (Nur et al., 2023). Through this many-sided classification, It emphasizes the vastness of pantun and its importance in the Malay literature.

Through this study, it is established that the classification of pantun is done through its structure and theme-based classification, and language features analysis. Through time the goals of the research are going to change and researchers would be able to educate themselves better on this classical Malay Literature and maintain its essence for further generations.

2.8 Review and Comparison of Existing Digital Archive Systems

This section, as part of the evaluation study, reviews existing digital archive software available on the internet. The assessment looks into their performance in terms of ease of use, extendibility and cultural relevance, providing some sort of direction for the goals of the proposed system. Looking at these tools, the objectives of this research are to determine what significant aspects with major functions could be replicated or modified or added in order to improve the effectiveness of the system which is to be proposed.

2.8.1 JendelaDBP

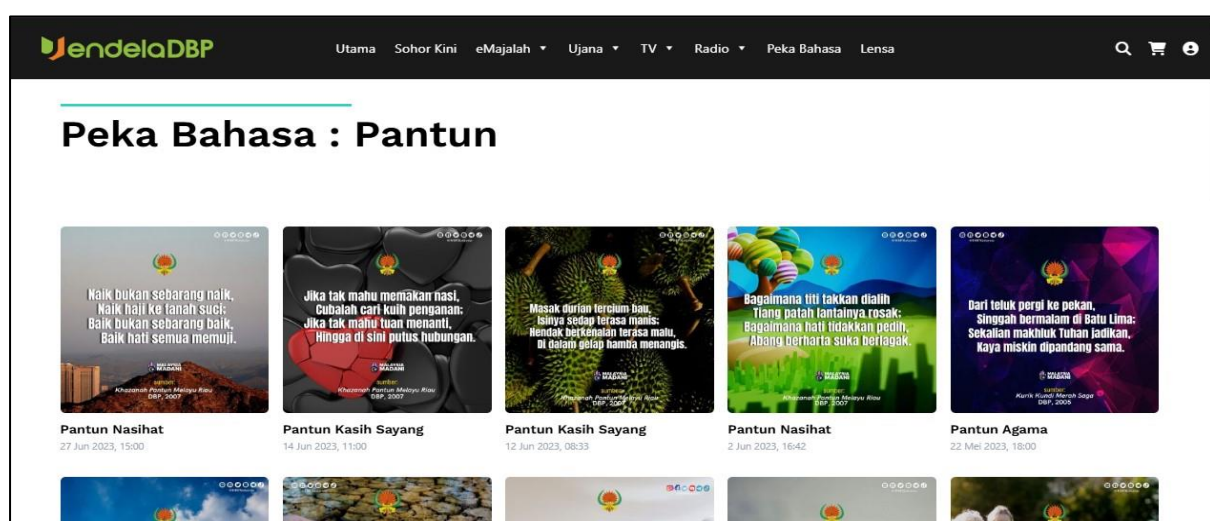


Figure 4. Main Page of JendelaDBP

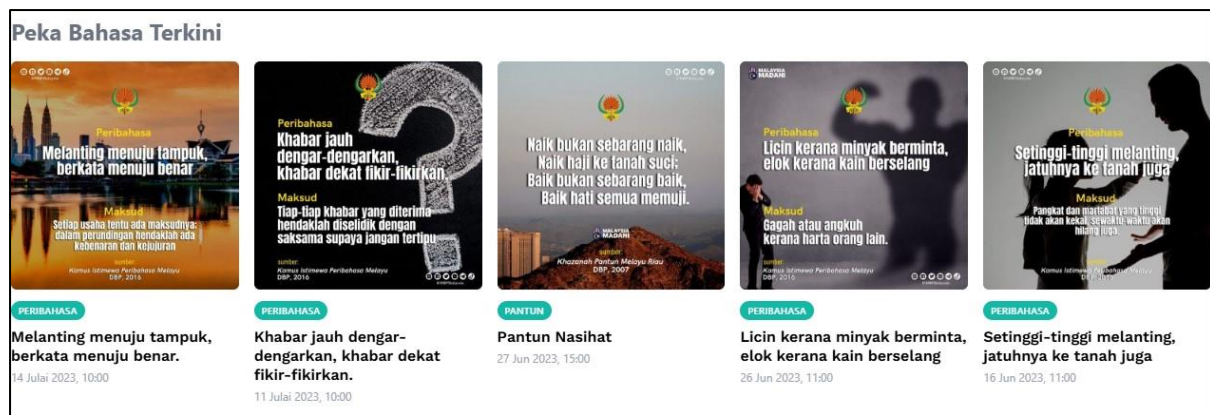


Figure 5. Different Categories of Contents

The main page of the JendelaDBP website, Figure 5, shows the interface which is straightforward yet informative designed to capture the attention of users easily. The website contains structural content as fractions are categorized into several poems and other writings enabling readers to study Malaysian literature in an organized and thorough way. The website is designed in a way that makes the resources refined enough to allow for easy movement and interaction.

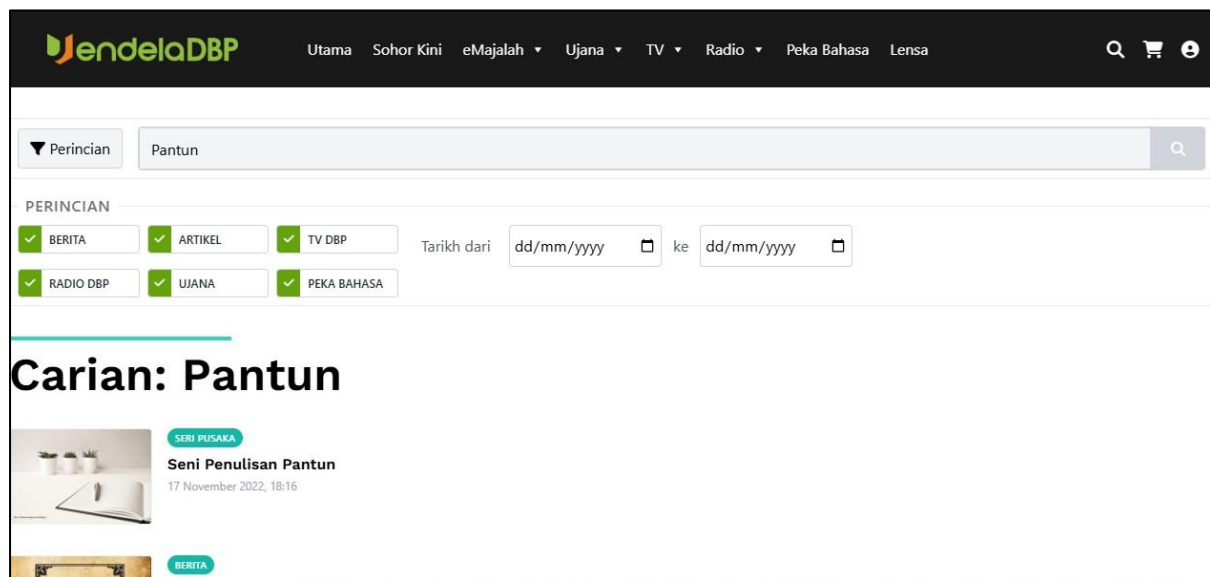


Figure 6. Search Function in JendelaDBP

In Figure 6 for the JendelaDBP, search functionality is shown allowing the users to key in relevant keywords to find particular information. The search function also contains search filtering features allowing users to narrow down the results by choosing certain dates and types of literature.



Figure 7. When user clicks on a Pantun

The pantun page, Figure 7, is a dedicated section showcasing a traditional Malay poetry from 2005. This page will show when a user clicks on a pantun. In this figure, the pantun is collected from a book 'Kurik Kundi Merah Saga'. It includes options for viewing and sharing the pantun. This helps to promote user engagement and cultural appreciation. However, this website lacks different functions where its feature is only displaying the pantun without its meaning or explanations.

2.8.2 PoetryFoundation.org

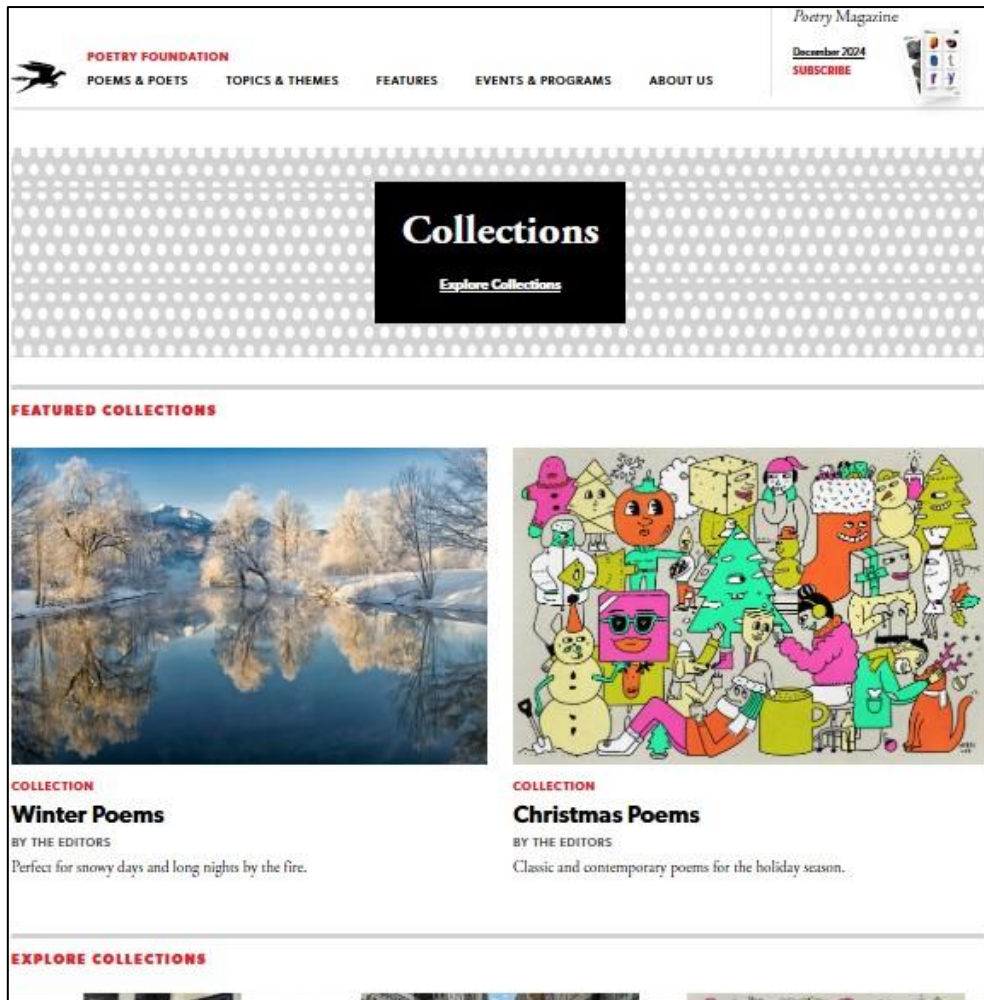


Figure 8. Main Page of PoetryFoundation.Org

The Poetry Foundation’s website homepage, as shown in Figure 8, forms part of the rich world of poetry for its admirers by presenting some contemporary and classic poems. It includes prominently demonstrated collections such as “Winter Poems” and “Christmas Poems” that correspond to holidays and seasons and make great starting points for further reading. The organized arrangement and the soothing interface have the effect of prompting the visitors to explore a variety of poetic works, textbooks and articles, and other content attached to the love and art of poetry. One of the major aims of this design is making the site easy to use and getting ordinary people or even those who love poetry to seek and use the information which they have.

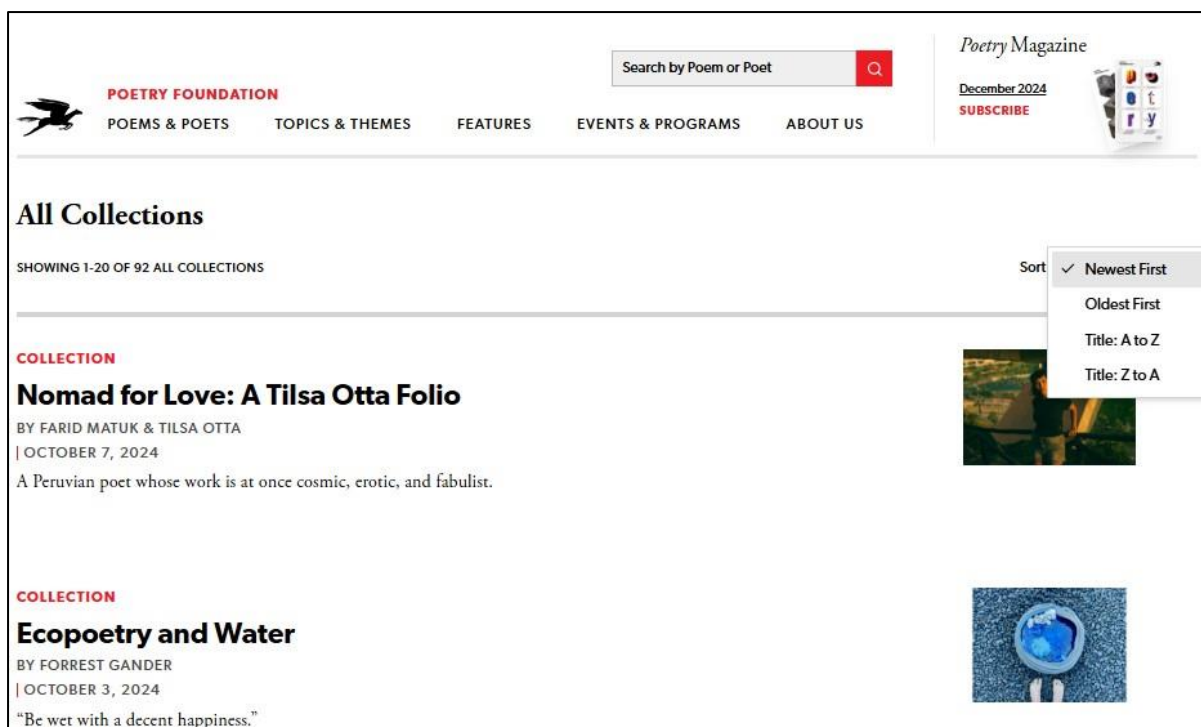


Figure 9. All Collections Page

PoetryFoundation.org has an “All Collections” page for all poetry collections where one can access a beautifully organized library of literature such as poetry which is at Figure 9. There is a filter for moving the works that are required to the top whether it is by the newest first oldest first or the alphabetical system which makes the search expansion to even the less popular works simpler. Each collection consists of a short description which gives information the purpose of collection of the highlighted poems.



Figure 10. Different Topics and Themes Available

The “Browse Topics & Themes”, Figure 10, further facilitates navigation by further classifying the poems into sets. This enables users to find poetry based on their preferences and also encourages them to gain a better understanding of the variety of themes and styles used. It aims at ease of use with engagement first that adds up to the entire literature experience.

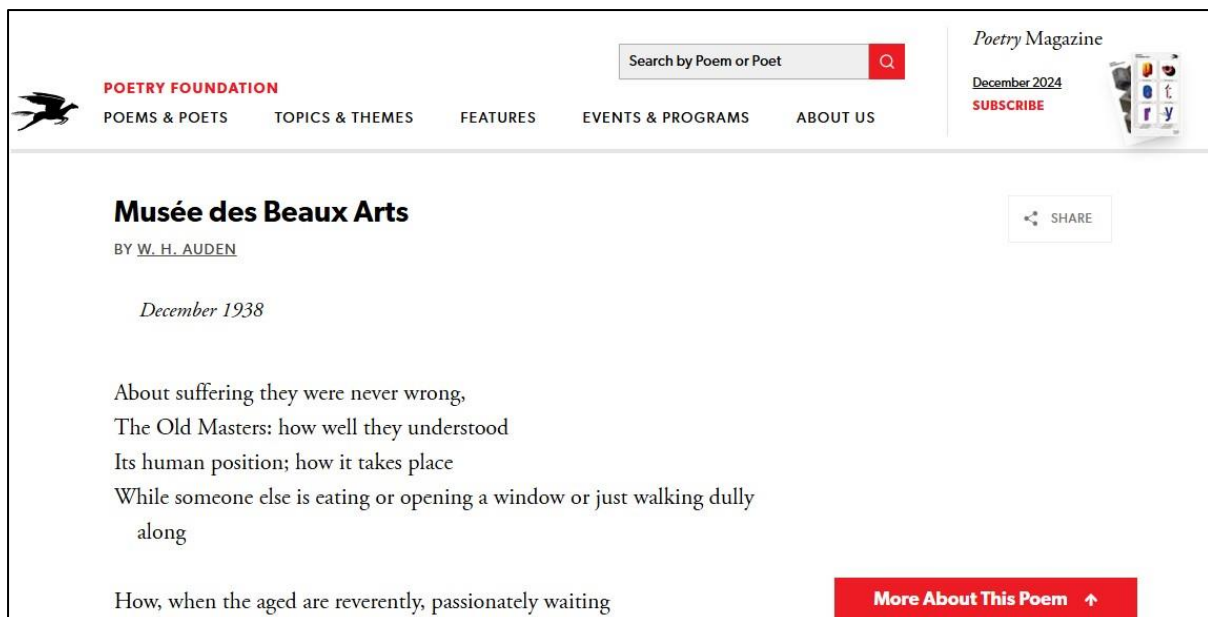


Figure 11. When a user clicks on a Poem

Figure 11 depicts how a poem is shown when an individual picks it from the website. Note that the poem in this figure does not provide audio playback options, though some poems do in order to improve access.

In contrast to poems without these options, the multimedia options point out the existence of audio and video components for enhanced engagement with the poem as shown in Figure 12 below. It has to be stressed, however, that there are some poems that do not include any of these options. This capability is a great improvement over other systems as it provides a livelier approach to the interaction with works of literature.

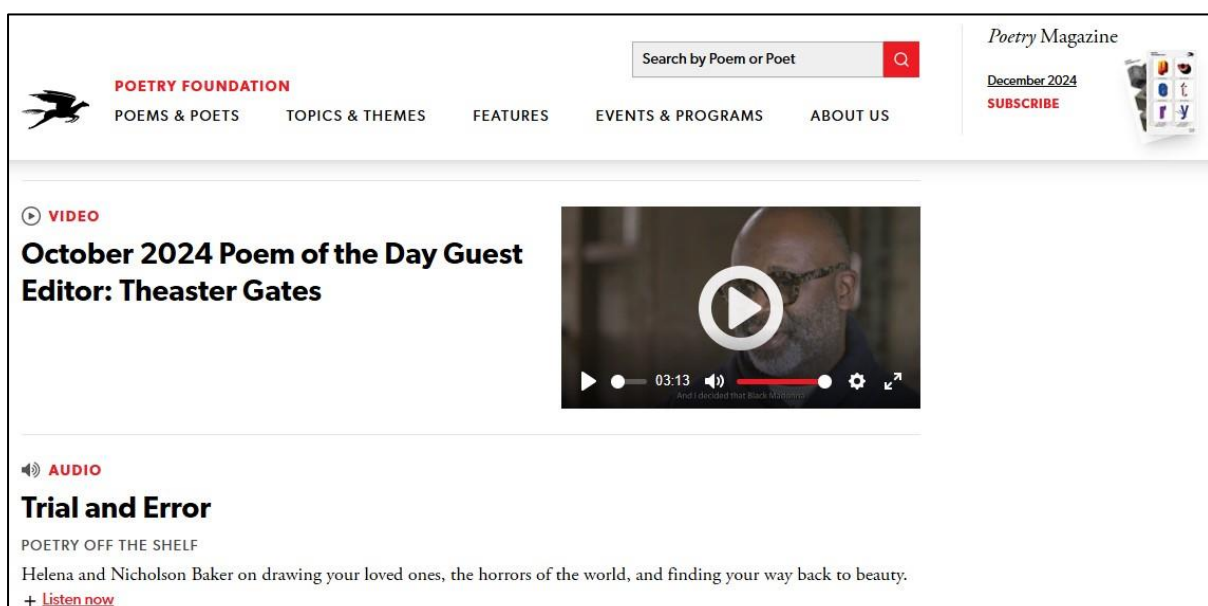


Figure 12. Audio & Video available

Poetry	Guidelines ▾	Submit
Translation	Guidelines ▾	Submit
Video Poems	Guidelines ▾	Submit
Visual Poetry	Guidelines ▾	Submit
Prose (essays about poetry - but not poems, prose poems, or fiction)	Guidelines ▾	Submit
Book Reviews	Guidelines ▾	Submit

Figure 13. User Submission

Figure 13 shows a page where user can submit their own work of poetry, translation, video poems, visual poetry, prose, or book reviews to PoetryFoundation.Org. Once submit, user will need to wait for confirmation from the organization and if accepted, their work will be published into their website.

2.8.3 Europeana



Figure 14. Europeana Main Page

Figure 14: The centrepiece of the Europeana website is the main page that focuses the interest of users towards the exploration of cultural heritage content. It showcases a stylish design while indicating the specific sections that have collections, therefore motivating the users to access a wide array of digitized materials and videos from Europe’s culture content providers.

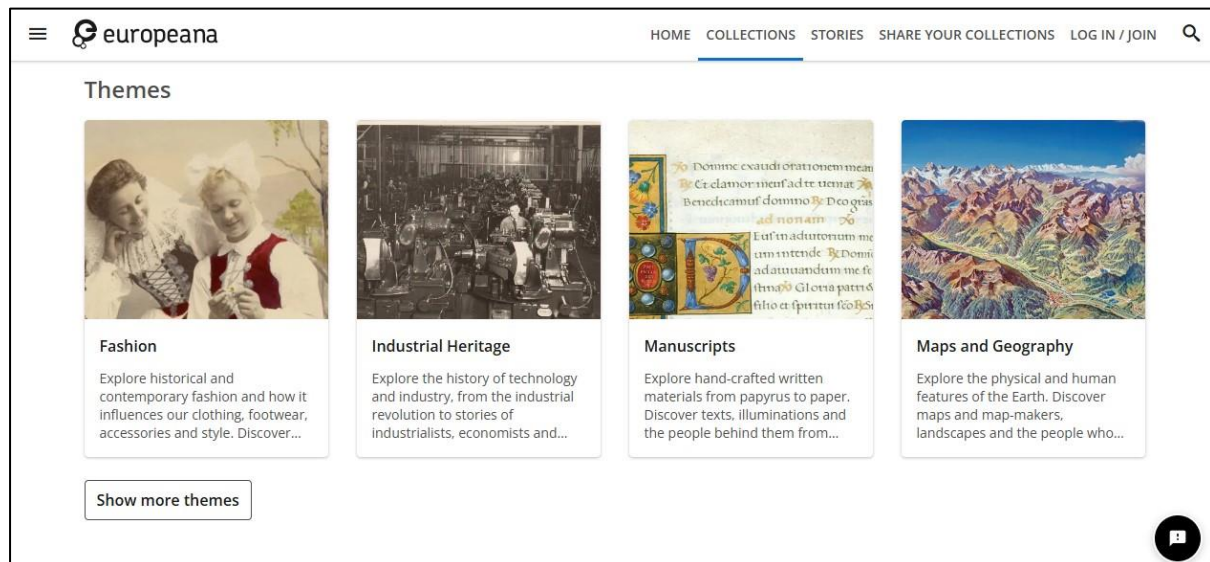


Figure 15. Different themes available in Europeana website

Figure 15: This figure provides the various thematic ways of browsing the content on Europeana’s portal. There is an offer based on the art, music, events or one can choose from any number of areas that one may want to explore. The selected themes in advance also help the user to better navigate Europeana’s collection.

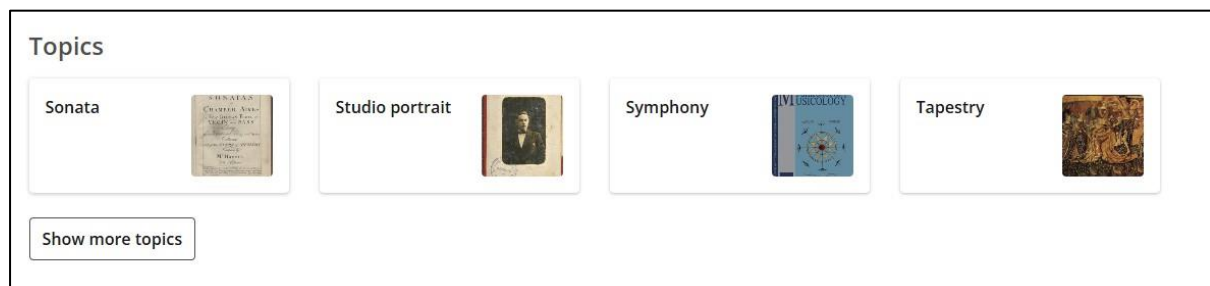


Figure 16. Different topics available in Europeana website

Figure 16: Another rendition of the thematic options displays the extent of such categorizations across Europeana. The website also uses custom themes so that the visitor can obtain the necessary content using the necessary means which can be structure for casual visitors and specialized for researchers.

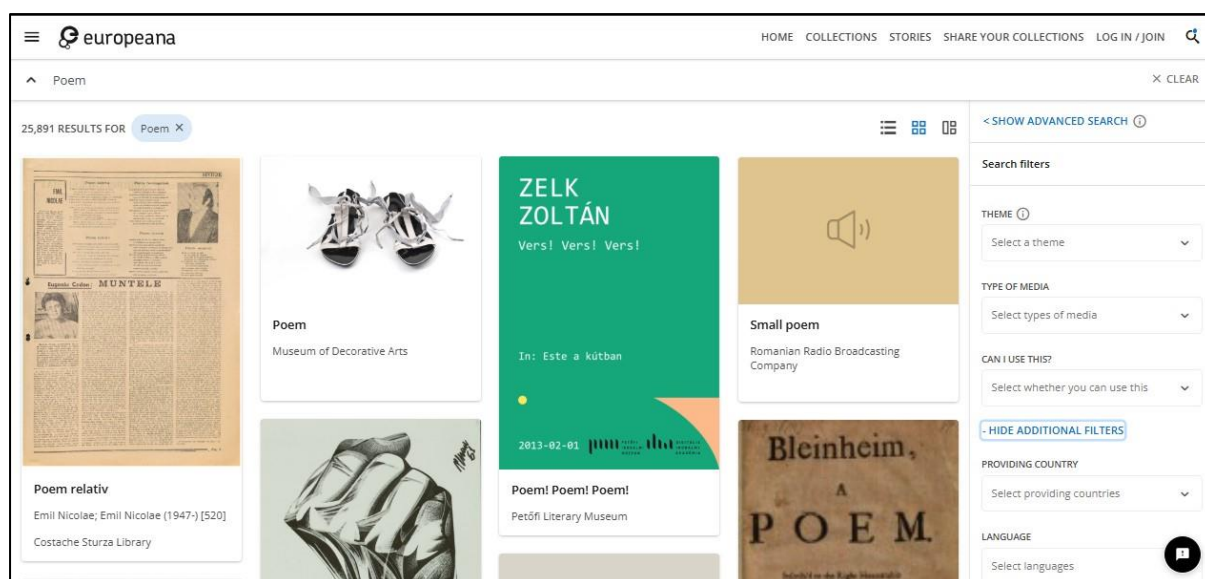


Figure 17. Content Display with Search Filter

Figure 17: This figure indicates the Europeana site layout of the content pages that use a search box with advanced options. With the help of these filters, the user has the possibility of deducing search results where collections display only the material type, region, and time frame which are relevant to one's interests.

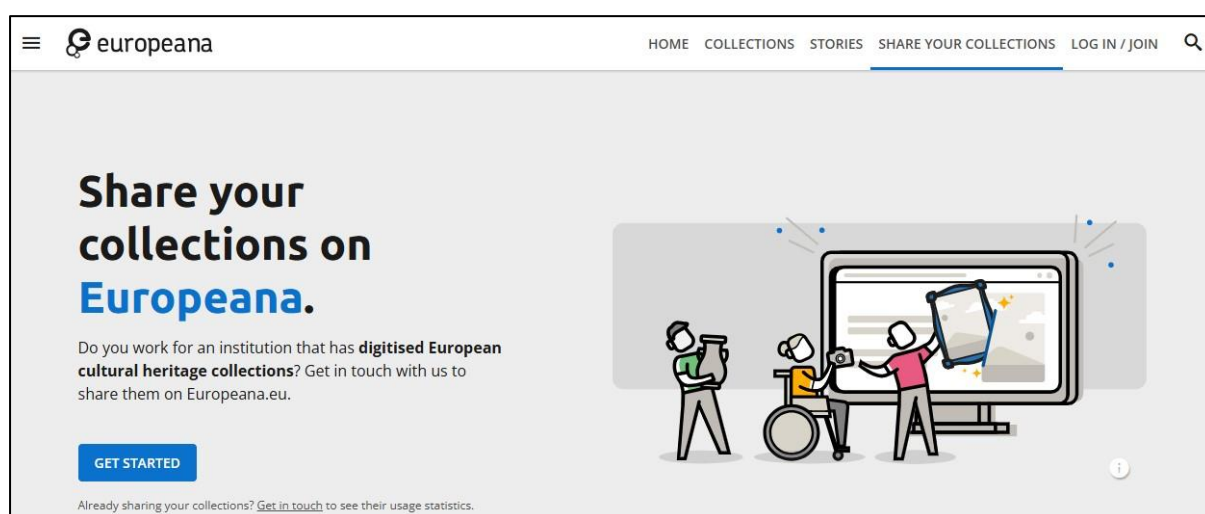


Figure 18. Sharing option

Figure 18: This figure depicts the sharing capabilities provided to users of the site Europeana. The convenience with which users can publicize their preferred content in this Europeana website with other users enhances the circulation and popularity of culture materials.

2.8.4 Comparison of The Existing Systems and Proposed System

Table 3.
Comparison Table

Features	JendelaDBP	PoetryFoundation. Org	Europeana	Proposed System
Login/Signup	No	No	Yes	Yes/No
Free Access	Free	Free	Free, but some features require collaboration with contributing institutions.	Free
Search Function	Yes	Yes	Yes	Yes
Pantun Response	No	No	No	Yes
User Contribution	Yes (Through e-mail)	Yes (Through system)	Yes (Through system)	Yes (Through system)
Auto-Categorization	No	No	No	Yes
Filter Options	Yes (Date, Type)	Yes (Sorting Option)	Yes (Themes, Date)	Yes (Category)
Audio Library	No	Yes (Some Poems)	Yes	No
Video Library	No	Yes (Some Poems)	Yes	No
Categories	Yes (Literary Works)	Yes (Thematic Collections)	Yes (Cultural Items)	Yes (Pantun Category)
Main Focus	Malaysian Literature	Poetry	European Heritage	Sarawak Mukun

Table 3 compares key features among four systems between JendelaDBP, PoetryFoundation.org, Europeana, and the proposed System. This comparison provides a clearer understanding of how the proposed system stands out in serving the cultural preservation and accessibility goals for Sarawak's Mukun Pantun.

All four systems consist of a search function, which improves ease of use when requiring a specific content. However, there are key differences when examining each system's features

more closely. Login/Signup functionality is required only on Europeana, while the other platforms including the proposed system which generally prioritize ease of access by not requiring users to register just to browse. This approach appeals to users who prefer immediate access without creating an account.

That said, the proposed system offers both options, first options allow users to freely explore and search the website without logging in. However, if user wish to upload or contribute new pantun, they are required to register an account. This strikes a balance between accessibility and control over content submissions.

When it comes to free access, all systems are generally free. However, Europeana includes features that require institutional collaboration, limiting some functionalities for individual users. The proposed system avoids such limitations by offering all features freely. A distinctive advantage of the proposed system is its 'Pantun Response' feature, which is absent from all the existing platforms. This interactive capability aligns well with the oral and responsive nature of Mukun Pantun, enhancing user engagement and cultural relevance. User contribution is available in all platforms, but the ease varies. JendelaDBP uses email for contributions, whereas the other three, including the proposed system, allow submissions directly through the system which helps in streamlining the process and encouraging user participation.

An important innovation in the proposed system is auto-categorization of pantun. This feature, which automates the organization of content into predefined categories, is entirely absent in the other systems. It reduces manual workload and ensures consistency in classification. Regarding filter options, all existing systems provide some form of filtering such as by date, type, or theme. The proposed system currently includes category filtering only, which is functional but could be further improved by integrating additional filter dimensions.

Audio and video libraries are present in PoetryFoundation.org and Europeana, offering users multimedia access to content. These features are not available in JendelaDBP or the proposed system. Incorporating such media in the future could enhance the proposed system's appeal, especially for auditory and visual learners. In terms of content categorization, all systems classify their materials based on focus areas: literary works (JendelaDBP), thematic collections (PoetryFoundation.org), cultural items (Europeana), and pantun categories (Proposed System). This alignment supports easier navigation and targeted exploration of content.

The main focus of each system underscores its cultural orientation: JendelaDBP highlights Malaysian literature, PoetryFoundation.org centers on global poetry, Europeana showcases European heritage, and the proposed system uniquely focuses on Sarawak Mukun Pantun. This specificity positions the proposed system as an essential digital tool for preserving a niche but culturally significant art form.

2.9 Summary

In summary, this chapter offered a more thorough perspective on the available literature regarding the protection of cultural heritage, especially the focus on its preservation through digital archival methods and the role of technology in such processes. It analysed several of the software systems currently employed in the management of culture and the use of aids to ensure that traditional modes of expression are protected. The review also emphasized the role of these technologies in the sustainability and preservation of the cultural performance. In addition, the third one highlighted the possibilities of utilizing the said existing technologies in Mukun Pantun preservation, emphasizing the prospects and the concerns that the said technologies may raise during the process of digitization. Such formulation provides the context within which the proposed system can be designed and built, thus also giving perspective in terms of preserving Mukun Pantun in the era of digital technologies.

Chapter 3: Methodology

3.1 Introduction

This chapter outlines the research methodology employed to achieve the objectives of this study, which aims to harness a digital archive for the conservation of Sarawak's Mukun pantun. This methodology is divided into a total of six stages which address different features of the research. This chapter will focus on the few stages of research methodology which includes literature review, data/pantun collection, data cleaning, digital archive development, system evaluation, and documentation. The development of the digital archive will adopt Waterfall Approach which allows a structured approach of the proposed website for the archive. This chapter serves as a guidance for the research and development process, laying the groundwork for the implementation phase in the subsequent chapter.

3.2 Project Methodology

The findings from Chapter 2 Literature Review, along with the insights on the preservation and digital archiving of Mukun Pantun, will be addressed during the literature review stage. In the system architecture stage, the system structure will be designed, including the architecture for the digital archive system that facilitates the retrieval and matching of appropriate pantun responses. In the development phase, the system is going to utilize the Waterfall model. The selected model is believed to focus on the effectiveness in the storage and retrieval of the pantun. In the evaluation stage, the system will be assessed based on its usability, timeliness in retrieving relevant pantun, and effectiveness. Finally, in the documentation phase, three documents are produced underpinning the work done, a thesis paper, a research paper and presentation slides. Figure 19 below illustrates the complete process of the project methodology.

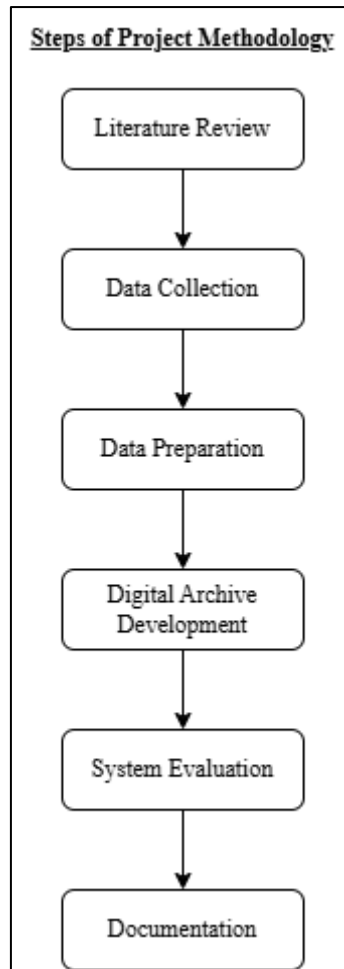


Figure 19. Steps of Project Methodology

3.2.1 Stage 1: Literature Review

This stage involved reviewing existing literature on Malay pantun, its classifications, and the role of digital archiving technologies. According to *Kurik Kundi Merah Saga Edisi Kedua*, pantun is a traditional Malay poetic form that embodies the richness of Malay language, thought, and cultural values, often serving as a medium for expressing emotions, wisdom, and social norms with reflecting distinct cultural and ethical values of the Malay community.

Digital archiving, as highlighted by Li-Yi et al. (2008), simplifies access to historical materials, enabling users to locate and explore collections online. Such technologies have widespread applications across industries and support the creation of electronic versions of artifacts, complete with metadata for enhanced accessibility (Wen et al., 2012).

Nur et al. (2023) further explored the structure of pantun, typically consisting of four lines with an (A-B-A-B) rhyme scheme. Classifications are based on theme, audience, and structure, with each category serving unique purposes, such as advisory pantun for imparting

wisdom and love pantun for expressing emotions. These studies provide a comprehensive understanding of pantun's diversity and its potential for digital preservation and exploration.

3.2.2 Stage 2: Data Collection

In this stage, pantun data is collected from multiple sources to create a diverse and representative dataset. The collection process focuses on pantun empat kerat (four-line pantun) and aims to capture the oral heritage of Mukun pantun. The sources include written texts (e.g., books and manuscripts), audio and video recordings, digital content from social media platforms. Refer to Appendix A for complete list of these resources.

Online materials can be considered as a source to look for pantun and they range from contemporary to the traditional form. Such sources usually offer pantun that has been digitized by cultural enthusiasts who share them online or archived the material.

Another source are books that contain pantun in their orthodox original style. The authors of these books are from Dewan Bahasa Purstaka (DBP), and these books help to know a lot more concerning the themes, and stylistic aspects of pantun. Thus, the combination of these sources ensures that the compiled dataset contains the sought for historical scope and the modern tactics of the pantuns collected.

3.2.3 Stage 3: Data Preparation

The collected pantun will undergo data cleaning process to ensure consistency, quality, and reliability for the digital archive. This includes resolving issues of duplicates, arranging the pantun into eleven thematic groups, and standardizing the data format, such as text structure, to create a cohesive and user-friendly dataset. By streamlining the data, this stage lays the foundation for efficient classification and retrieval within the system.

As mentioned in stage 2, pantun's construction is usually composed of four lines with alternating rhyme patterning and single rhyme patterning, A-A-A-A or A-B-A-B. These classifications will be based on themes, audience, and structural features and they serve different functions, for example there are advisory pantuns which is meant for passing wisdom or sayings in a love pantun which is to express feelings. This methodology is worthy embedding in the data classification because it guarantees that the electronic archive reflects the various forms and the cultural aspects of pantun thus allowing the study and preservation of this form of traditional art.

The collected pantun undergoes a data cleaning process to ensure consistency and quality. The steps include:

1. Identifying and removing redundant entries.
2. Categorizing pantun into the eleven thematic groups.
3. Standardizing the data format (text).

This process ensures the creation of a reliable and user-friendly digital archive, enabling efficient classification and retrieval of pantun.

3.2.4 Stage 4: Digital Archive Development

3.2.4.1 System Development Life Cycle

This application will be built using the concepts of Software Development Life Cycle (SDLC). The aim of SDLC is to design, develop, and produce high quality software that matches user needs using SDLC models (Santonanda et al., 2022). SDLC models that are used in this application are waterfall models . Waterfall models are used due to its stability software development in a clear and specific way (Santonanda et al., 2022). Santonanda et al. (2022) points out that in developing some application, the waterfall methodology is used because the waterfall methodology is suitable for generic systems or software, meaning that the system can identify all its needs from the start with general specifications and suitable for software who have the goal of building a system from scratch collect system requirements to be built in accordance with selected research topic until the product is tested.

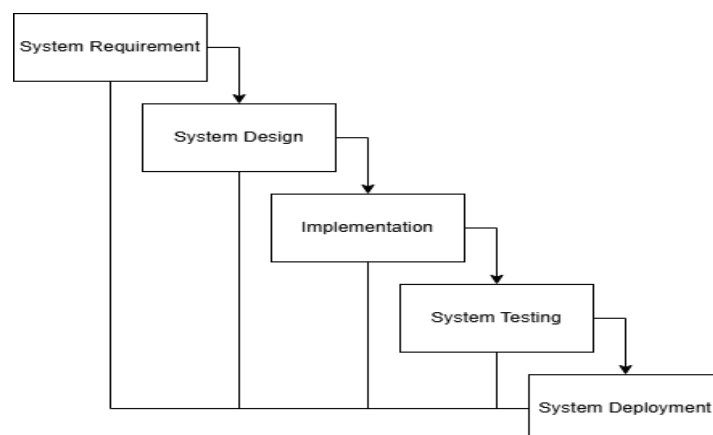


Figure 20. Waterfall Model

3.2.4.2 System Requirement

The system requirements for the digital archive are divided into functional and non-functional requirements. Functional requirements include the ability to upload, categorize, and search pantun data, as well as providing a user-friendly interface for users to navigate the system easily. Users should also be able to contribute pantun, view the pantuns, and explore archived materials efficiently. The data for this system requirement is pantun empat kerat (four-line stanzas). Non-functional requirements focus on system performance, reliability, and security. The platform should ensure fast search response times, handle concurrent users effectively, and safeguard user data and contributions through secure protocols. The hardware requirements include a server with adequate processing power, memory, and storage to host the digital archive. The software requirements include a web development framework, a relational database management system for data storage, and a responsive front-end design compatible with various devices and browsers.

Use Case Diagram

The Use Case Diagram shown in Figure 21 explains the interactions of the user and the system being designed. It outlines and defines the functions that are performed by the system and the specific users within the “Harnessing Digital Archives for the Conservation of Sarawak's Mukun Pantun” project. In this system, the most important actor is the User and Admin. User is able to search, browse, and upload pantun. Admin will be managing the pantun contents and user's data. When a pantun is uploaded by the user, the system will put the pantun to go through the auto-categorization feature. Once done, the pantun will be sent to admin for approval then save the uploaded pantun into the database. If the admin clicks ‘Approve, then the system will display the results. User has the ability to upload new pantuns by typing in the pantun line by line and clicking the upload button. Keywords can be entered by user in order to search Pantun, results of the search will be displayed to the user. There is also an option to find a response pantun for the searched pantun and it will be displayed to the user as well. This diagram outlines the core functional requirements of the system while also presenting its applicability in relation to Mukun Pantun activities.

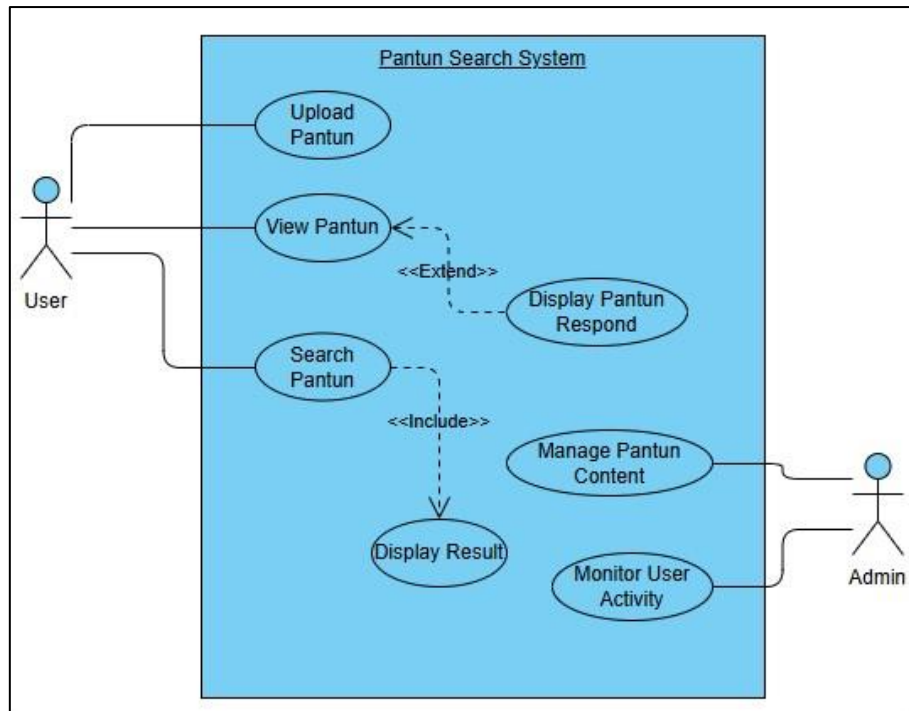


Figure 21. Use Case Diagram of the system

Table 4.
Use Case Description ID 1

Use Case ID	1
Use Case Name	Upload Pantun
Actors	User
Description	User uploads a new pantun to the system.
Trigger	User clicks the 'Upload' button.
Pre-conditions	User has a pantun to upload.
Post-conditions	The pantun is successfully stored in the system.
Normal Flow:	1. The user navigates to the upload section. 2. The user enters the pantun line by line in the provided textboxes. 3. The user clicks the 'Upload' button. 4. The system stores the pantun and sends to admin for approval.
Exception Flow:	[E1: Incomplete Pantun]: If the user does not fill in all four lines, the system displays an error message and prevents the upload.
Extends:	N/A
Includes:	N/A

Table 5.
Use Case Description ID 2

Use Case ID	2
Use Case Name	View Pantun
Actors	User
Description	User views the available pantun in the system.
Trigger	User navigates to the pantun viewing section.
Pre-conditions	The system has stored pantun.
Post-conditions	User successfully views the selected pantun.
Normal Flow:	1. The user navigates to the pantun viewing section. 2. The system displays the list of available pantuns. 3. The user selects a pantun to view. 4. The system displays the selected pantun with suggested response.
Exception Flow:	[E1: No Pantun Available]: If there are no stored pantun, the system displays a message stating “No pantun available.”
Extends:	Display Pantun Respond
Includes:	N/A

Table 6.
Use Case Description ID 3

Use Case ID	3
Use Case Name	Search Pantun
Actors	User
Description	User searches for a pantun using keywords.
Trigger	User enters a keyword in the search bar and clicks ‘Search’.
Pre-conditions	The system contains stored pantun.
Post-conditions	User successfully views search results based on the entered keyword.
Normal Flow:	1. The user enters a keyword in the search bar. 2. The user clicks the ‘Search’ button. 3. The system retrieves and displays pantun that match the keyword.

Exception Flow:	[E1: No Matching Pantun]: If no pantun matches the keyword, the system displays a message stating “No results found.”
Extends:	N/A
Includes:	Display Result

Table 7.
Use Case Description ID 4

Use Case ID	4
Use Case Name	Manage Pantun Content
Actors	Admin
Description	Admin edits or deletes an existing pantun in the system.
Trigger	Admin selects a pantun and chooses to edit or delete it.
Pre-conditions	The system has stored pantun.
Post-conditions	The pantun is successfully updated or deleted.
Normal Flow:	1. The admin selects a pantun from the list. 2. The admin chooses to edit or delete the pantun. • If editing: The admin updates the pantun and clicks ‘Update’. • If deleting: The admin confirms the deletion. 3. The system updates or removes the pantun accordingly.
Exception Flow:	[E1: Edit/Deletion Failed]: If the action cannot be completed due to a system error, a message is displayed stating “Unable to process the request.”
Extends:	N/A
Includes:	N/A

Table 8.
Use Case Description ID 5

Use Case ID	5
Use Case Name	Monitor User Activity
Actors	Admin
Description	Admin tracks user interactions with the system.
Trigger	Admin accesses the user’s profile activity log.

Pre-conditions	The system records user activities.
Post-conditions	Admin successfully views user activity logs.
Normal Flow:	1. The admin logs into the system. 2. The admin navigates to the user's profile activity section. 3. The system displays logs of user's details and contributed pantun.
Exception Flow:	[E1: No Activity Data]: If no user activity data is available, the system displays a message stating "No pantun contributed."
Extends:	N/A
Includes:	N/A

3.2.4.3 System Design

The System Design phase serves as the backbone for the platform, where wireframes and user interface (UI) mock-ups are created to visualize the user experience. This stage also involves developing Unified Modelling Language (UML) diagrams, including Use Case Diagram, Sequence Diagram and State Diagram, to outline system interactions and processes, establishing a structured framework for development. This phase establishes a well-organized structure to guide platform implementation.

Profiling Corpus

The profiling process begins with collecting datasets of pantun empat kerat. This dataset serves as the foundation for subsequent cleaning and organization tasks. Redundant or duplicate *pantun* entries are identified and removed from the dataset to ensure only unique and meaningful *pantun* are retained. Spelling errors within the *pantun* are identified and corrected to maintain textual accuracy and readability throughout the dataset. The pantun is standardized to follow the correct structure and format, including adherence to the A-A-A-A or A-B-A-B rhyme scheme, ensuring consistency and cultural authenticity. Each pantun is analysed and categorized into one of 11 thematic groups such as advice, love, or religion by using a simple corpus and scoring method to facilitate efficient retrieval and meaningful exploration by users. Metadata, such as theme, structure, and context, is assigned to each pantun entry to enrich its informational value and improve searchability within the digital archive. The finalized pantun

dataset is structured and organized systematically, making it ready for integration into the digital archive system for public access and preservation.

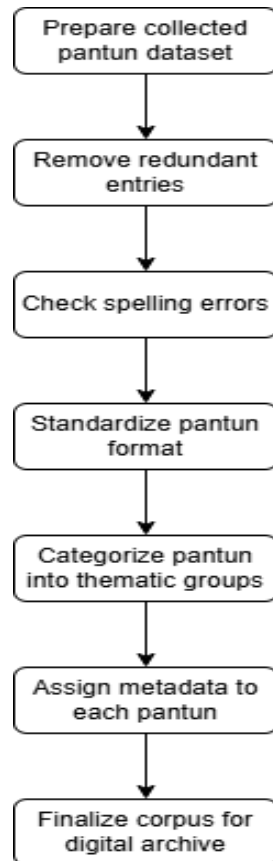


Figure 22. Profiling Corpus

Sequence Diagram

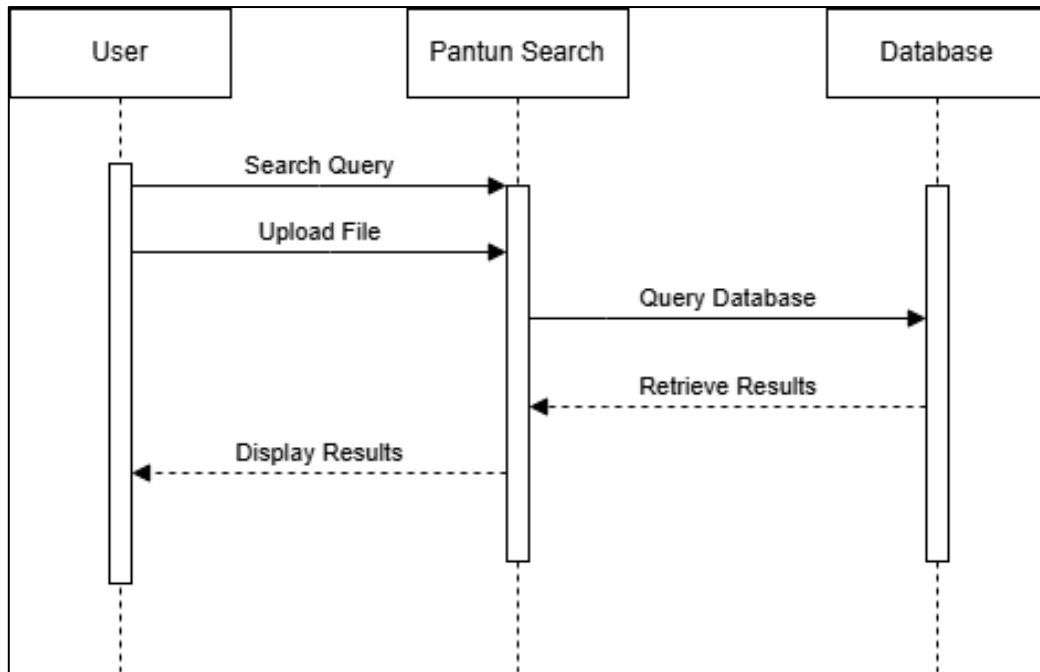


Figure 23. Sequence diagram of the proposed system

A Sequence Diagram is a dynamic UML diagram that shows the effective participation of the objects in the system to be developed. Figure 23 describes the order of the users, interaction through the Digital Archive System and the Database while searching for Pantun and retrieving it.

The diagram illustrates how the system's user starts the process by sending out a search query or upload a file through the website's search feature. The system answers the query and contacts the database for results. These results are then shown to the system user. This sequence of actions models the dynamic aspects of the system by both describing the flow of orientation messages and exchanges across the system, while emphasizing the functional aspects of the functional requirements of the archive system.

State Diagram

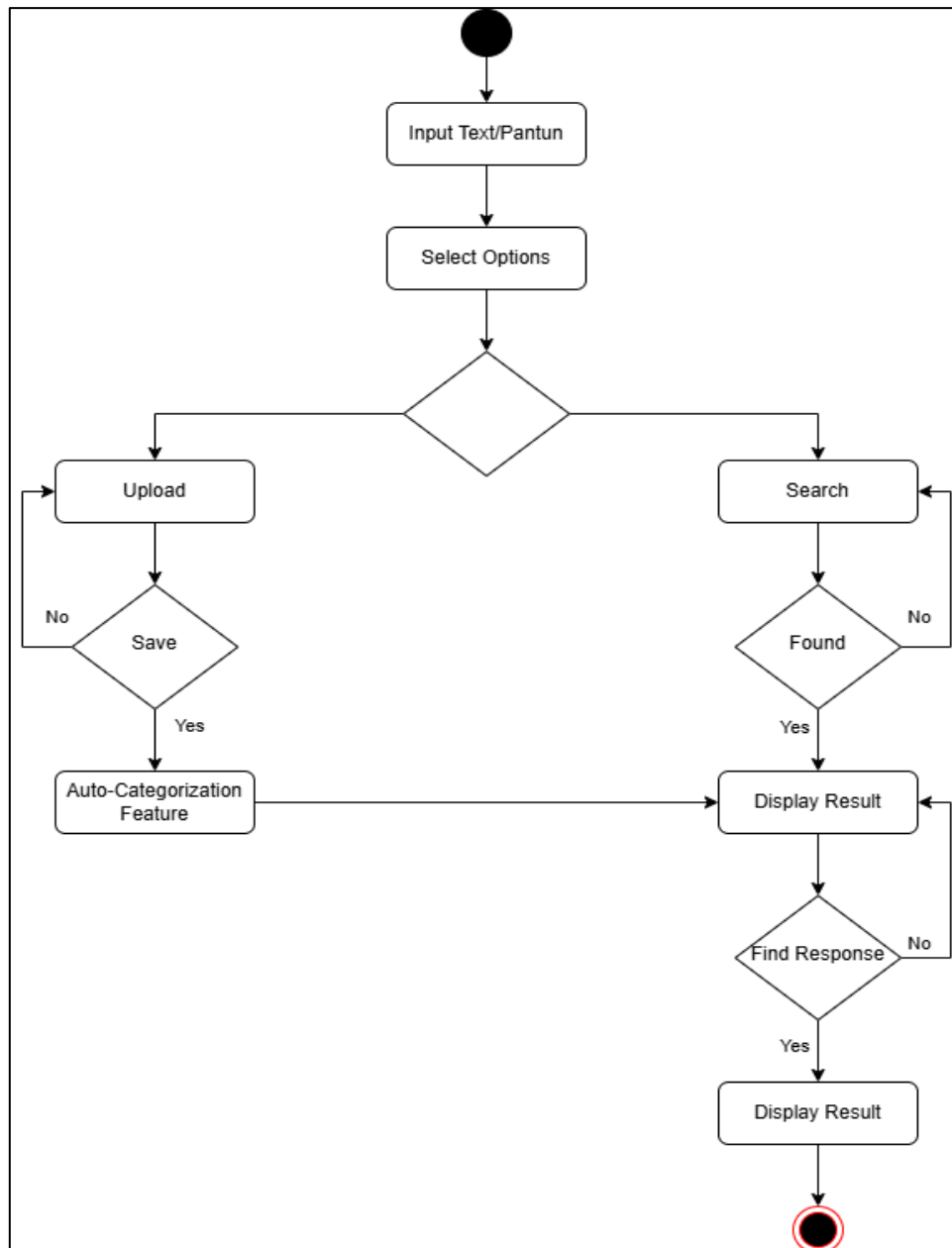


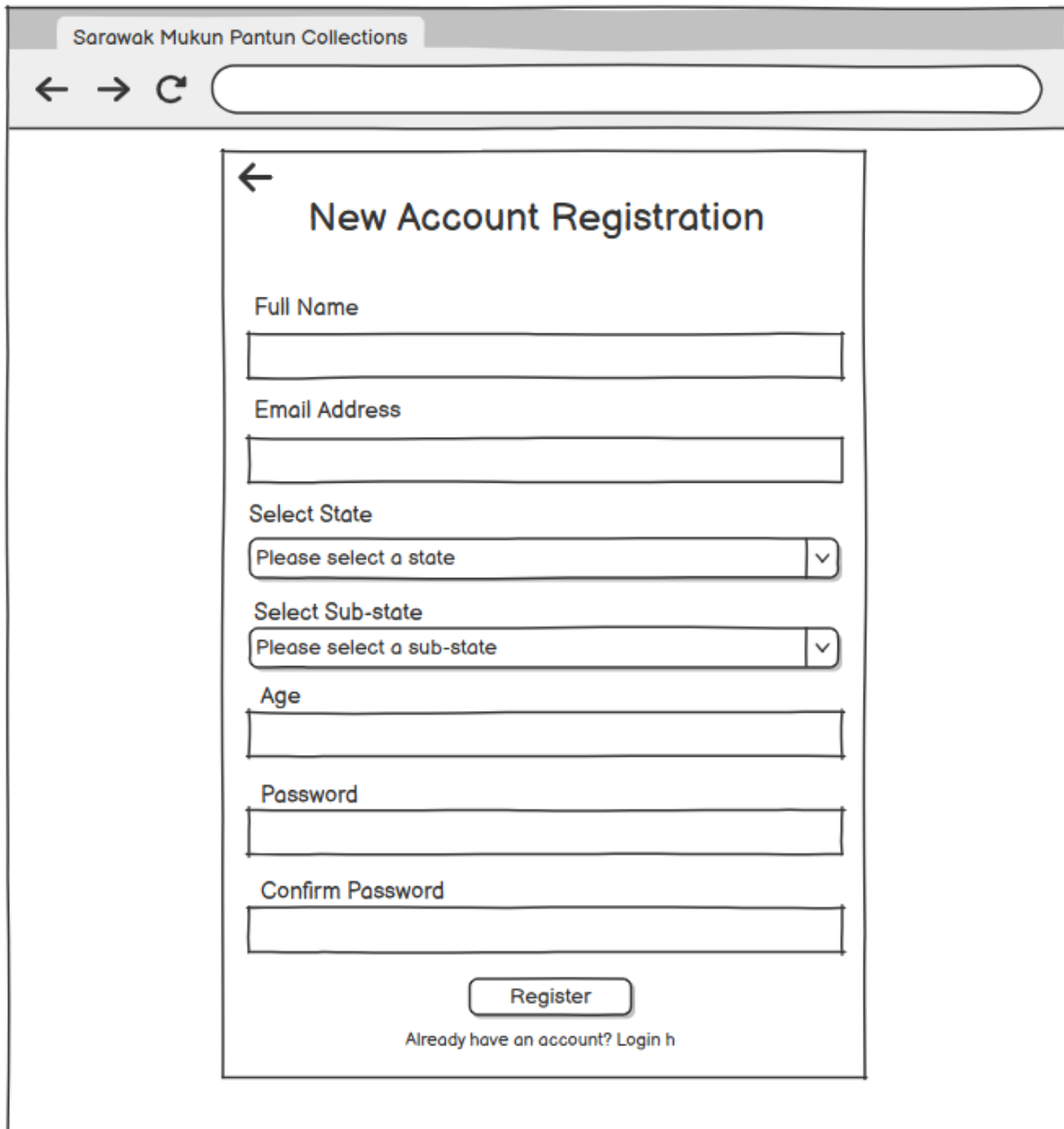
Figure 24. State diagram for the proposed system

The state diagram begins with the user inputting a text file. The system checks whether the input is a file. If it is, the system converts the file into text format. Once the text is ready, the user has two options: upload the file or type directly into the search function to look for a Pantun. If the user selects the upload option, the system prompts them to decide whether to save the file. If the user chooses not to save, the system returns to the upload state. If the user chooses to save, the system proceeds to an auto-categorization feature, after which it displays

the results. If the user opts to search, the system attempts to find the relevant Pantun in the database. If no matches are found, the system returns to the search state. If a match is found, the results are displayed. After the results are displayed, the user is given the option to find a response for the displayed Pantun. If the user declines, the system returns to the display results state. If the user chooses to find a response, the corresponding results are displayed. The system ends once all interactions are complete.

System Mock-up

In this section, the process of designing the user interface of the new system using mock-ups developed with the help of Balsamiq website. These mock-ups outline the development of the website to the users, admins, as well as the developer, in terms of its appearance and functioning, and provides a clear understanding of how the designed system is meant to look and act. The system features enhanced functionalities such as account management, improved pantun browsing, and an administrator dashboard for content moderation and user control.



The image shows a web browser window with the title "Sarawak Mukun Pantun Collections". The browser's address bar is empty. The main content area displays a "New Account Registration" form. The form is enclosed in a box with a back arrow in the top left corner. It contains the following fields: "Full Name" (text input), "Email Address" (text input), "Select State" (dropdown menu with "Please select a state" and a downward arrow), "Select Sub-state" (dropdown menu with "Please select a sub-state" and a downward arrow), "Age" (text input), "Password" (text input), and "Confirm Password" (text input). Below the "Confirm Password" field is a "Register" button. At the bottom of the form box, there is a link that says "Already have an account? Login h".

Figure 25. New Account Registration Page

The New Account Registration Page, as shown in Figure 25, serves as the first step for new users. It simplifies the process of creating a user profile by gathering essential information like username, email, and password. This approach ensures that only verified users can actively engage with the pantun archive, fostering a secure and responsible digital environment. The layout is straightforward and user-friendly, prioritizing accessibility while keeping the input process organized.

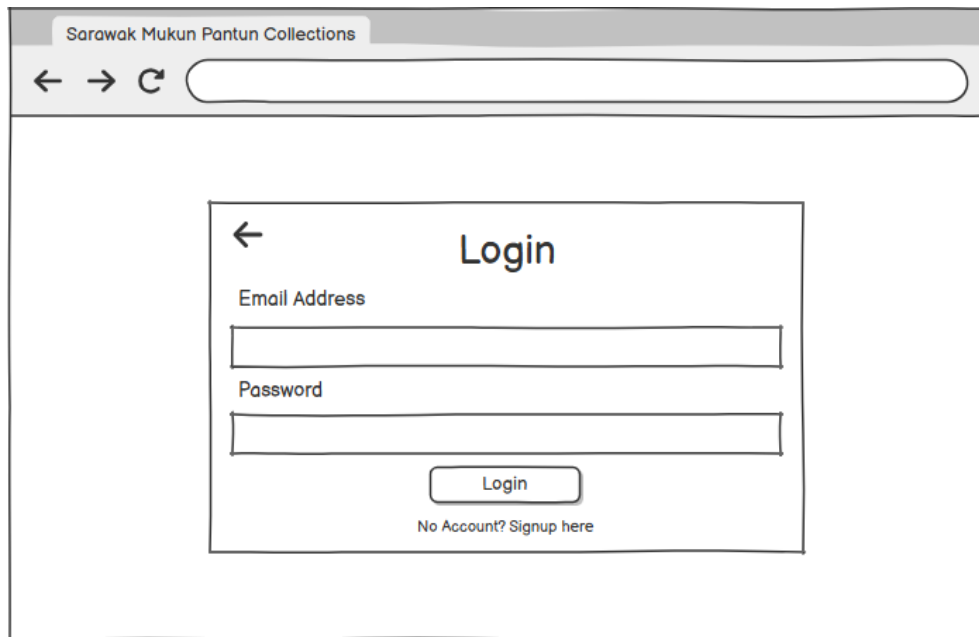


Figure 26. Login Page

In Figure 26, the login page offers a secure gateway for both regular users and administrators to access the system. Users authenticate their identity by entering their registered email and password. With a clean and minimal interface, the page simplifies the login process while ensuring a professional look.

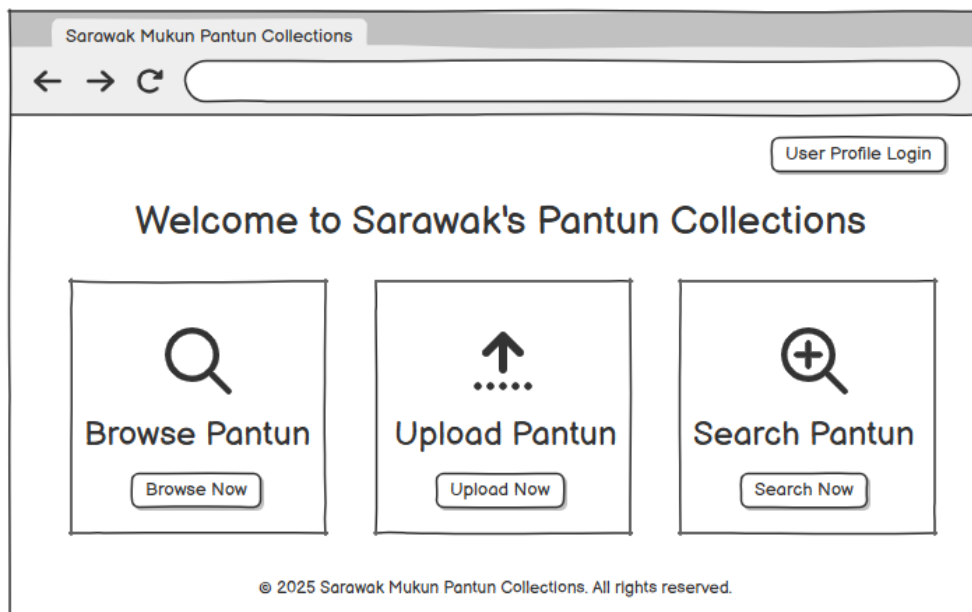


Figure 27. Main Page of the proposed system

The Main Page, as shown in Figure 27, acts as a central hub for all users. It makes it easy to browse, upload, or search for pantun entries. With its user-friendly design, the page features clear buttons and links that guide users to different functions.

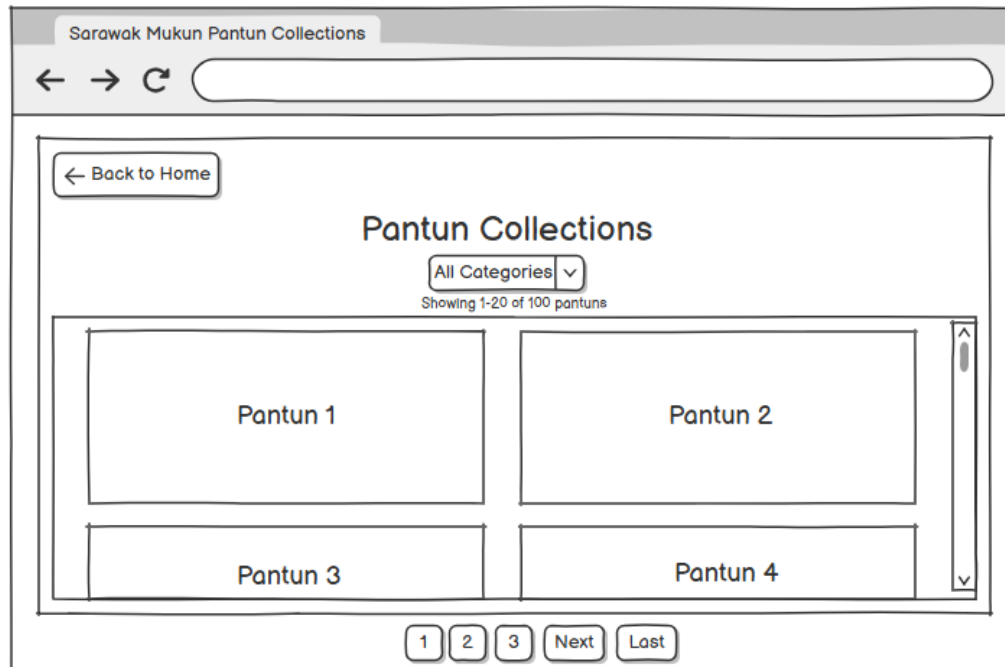


Figure 28. Browse Pantun Page

In Figure 28, the Browse Pantun Page allows users to explore the existing pantun database. Pantuns are displayed in an organized and scrollable format, with a filter to show categorized pantun for easier navigation. Each pantun entry includes a button to view more details or access related responses. The clean design of this page promotes readability and encourages users to engage more deeply with the archive by offering an intuitive browsing experience.

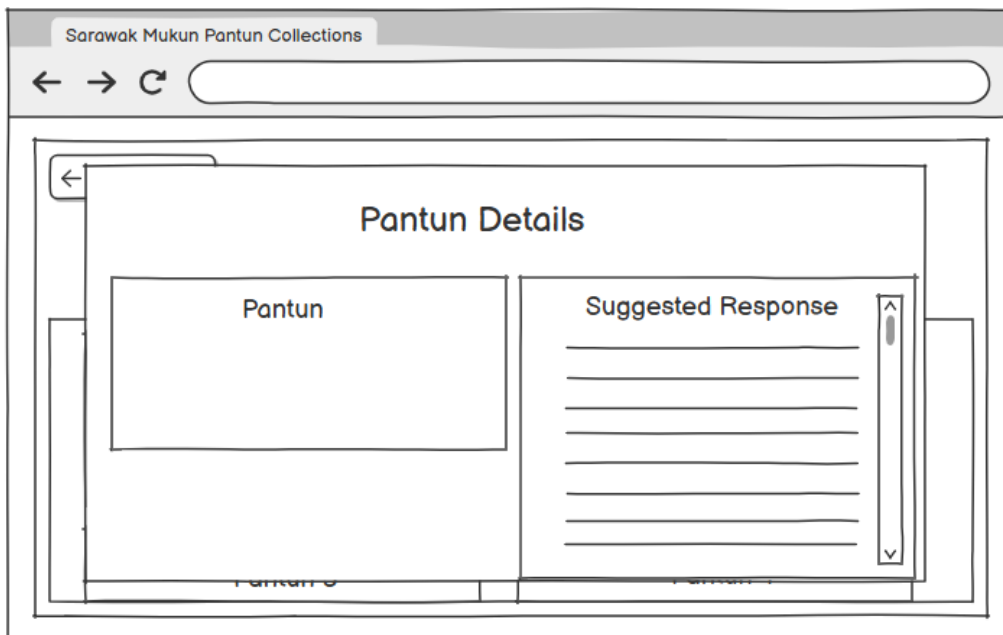


Figure 29. Pantun-Response Pop-up

Figure 29 illustrates the Pantun-Response Pop-up, which appears when a user selects a pantun for detailed viewing. It displays the selected pantun on one side and its suggested response on the other. This feature enhances interactivity and mirrors the conversational structure of Mukun pantun, offering users immediate context and potential inspiration for crafting their own responses.

Figure 30. Upload Pantun Page

In Figure 30, the upload pantun page enables registered users to contribute new pantuns to the archive while public users are not allowed to upload any pantun to the database. Users may type the pantun directly into each of the text field and the system will perform automatic categorization. Once submitted, the system processes the entry, categorizes it, and displays a preview back to the user and sends the pantun to admin side for approval. This workflow ensures the data remains organized while simplifying the upload process, thereby encouraging contributions from a broad user base.

The image is a wireframe of a web application interface for searching and viewing pantun collections. It is presented within a browser window titled "Sarawak Mukun Pantun Collections".

The main content area is divided into two primary sections:

- Pantun Search:** This section is located at the top. It includes a "Back to Home" button on the left. The title "Pantun Search" is centered. Below the title is a "Search Results" input field. Underneath this are four stacked text input fields, each with a placeholder: "Enter Line 1 of your pantun...", "Enter Line 2 of your pantun...", "Enter Line 3 of your pantun...", and "Enter Line 4 of your pantun...". At the bottom of this section are two buttons: "Search" and "Clear".
- Pantun Collections:** This section is located below the search area. It features a category filter dropdown menu currently set to "All Categories". To the right of the filter, it says "Showing 1-20 of 100 pantuns". The main area of this section displays a grid of four pantun preview boxes, labeled "Pantun 1", "Pantun 2", "Pantun 3", and "Pantun 4". A vertical scrollbar is visible on the right side of this grid.

At the bottom of the page, there is a pagination control with buttons for "1", "2", "3", "Next", and "Last".

Figure 31. Search Pantun Page

The Search Pantun Page, as shown in Figure 31, is a tool for users looking to locate specific pantuns or themes. It features a keyword-based search interface, allowing for efficient querying across the database. The results are displayed dynamically, enabling users to quickly find matching pantuns and explore their corresponding responses. This feature significantly enhances the system's usability, especially for research or educational purposes.

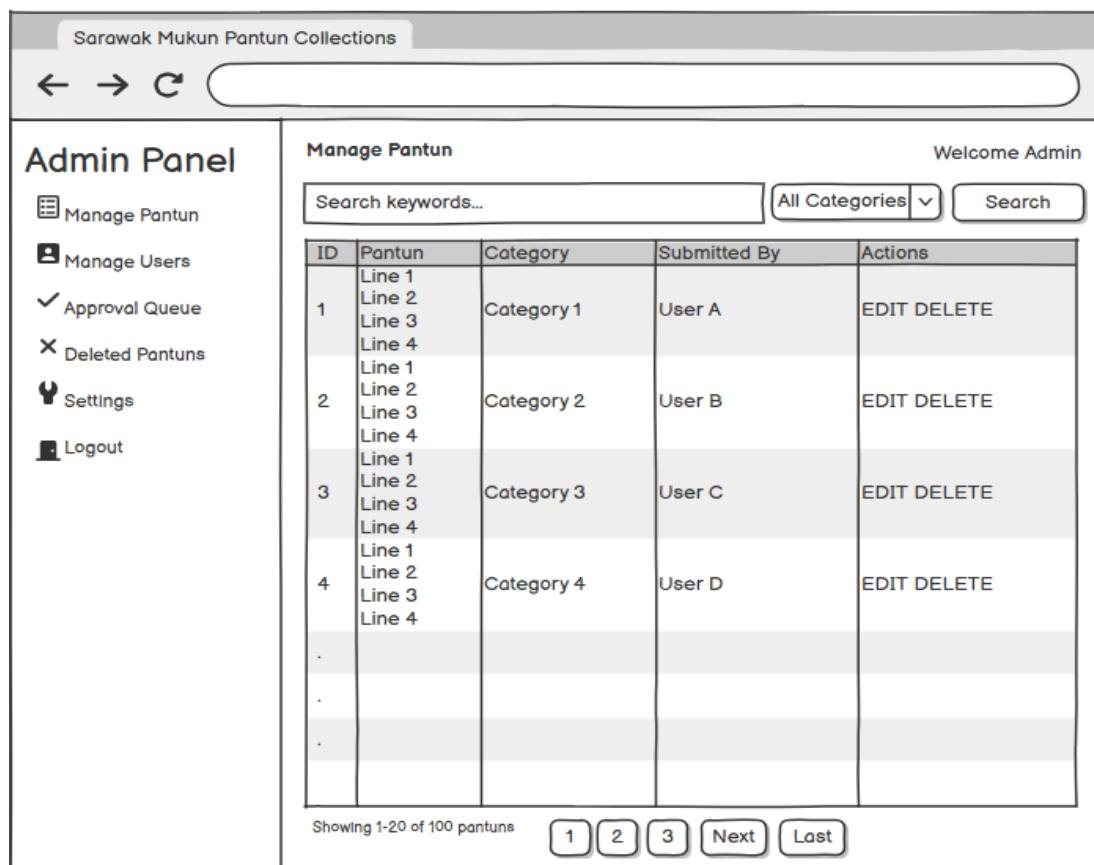


Figure 32. Admin Panel - Manage Pantun Page

Figure 32 shows a page that is a part of the administrator interface and provides access to the Manage Pantun module. Administrators can review, edit, or delete pantun entries from the database. This feature is crucial for maintaining the quality and accuracy of the archive, allowing for the moderation of inappropriate content or erroneous entries. The interface is designed for clarity and efficiency in content management.

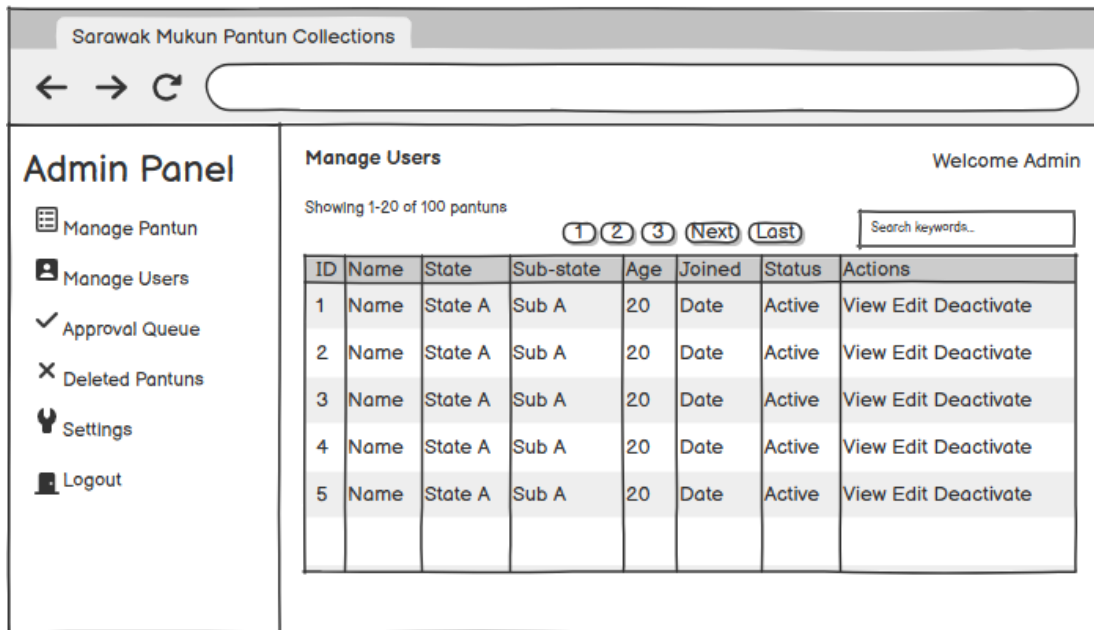


Figure 33. Admin Panel - Manage Users Page

In Figure 33, the Manage Users Page within the admin panel allows administrators to oversee registered users. Actions include viewing user profiles, suspending accounts, or resetting credentials. This functionality is essential for ensuring a safe and respectful community environment. The design prioritizes administrative oversight while offering control mechanisms to address user-related issues promptly.

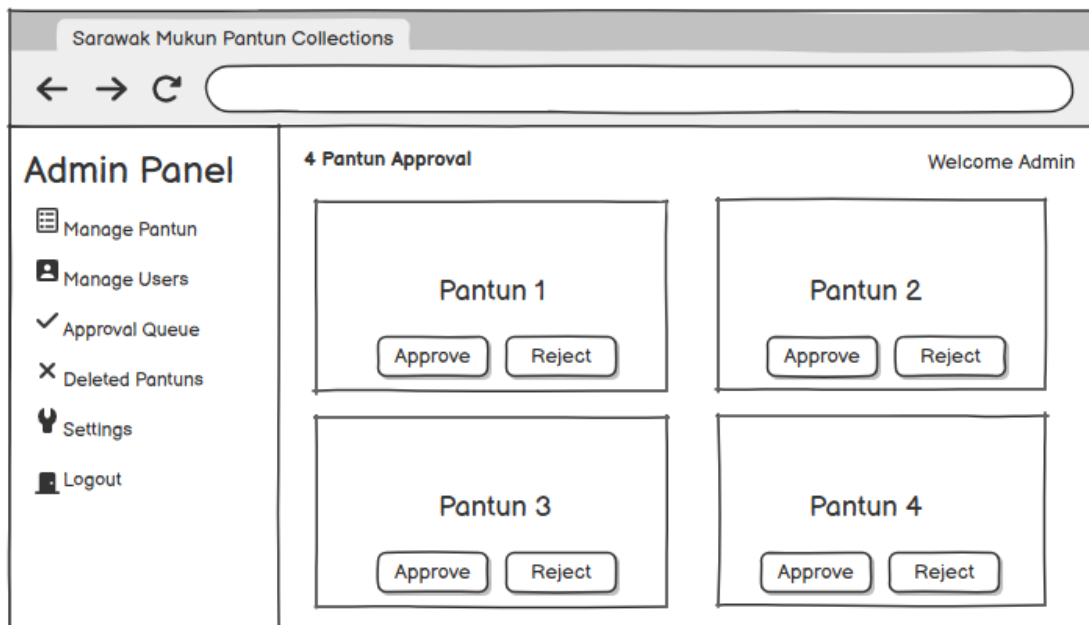


Figure 34. Admin Panel - Pantun Approval Page

In Figure 34, before the newly submitted pantuns are made public, they appear on the Pantun Approval Page. Administrators can review these entries for quality and relevance. This gatekeeping mechanism ensures that only appropriate and meaningful pantuns are added to the digital archive. The layout supports a streamlined approval process with clear indicators for action.

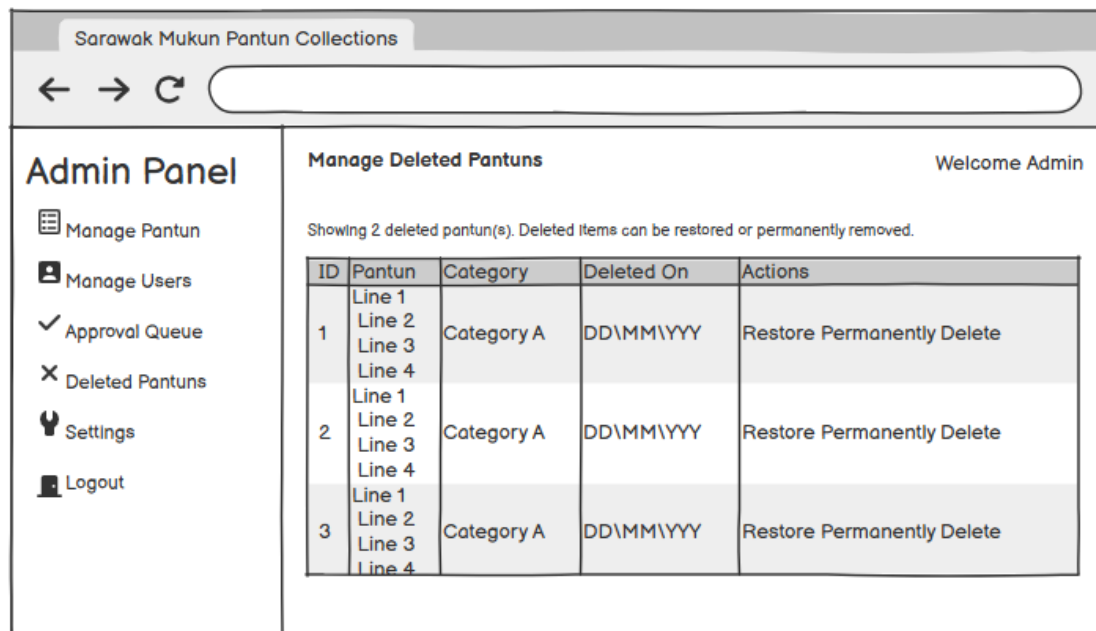


Figure 35. Admin Panel - Deleted Pantun Page

In Figure 35, this page displays a log of deleted pantuns, including metadata such as deletion date and reason. It serves as an audit trail, allowing administrators to track and potentially restore removed content if needed. The Deleted Pantun Page reinforces transparency in content management and supports data recovery and accountability.

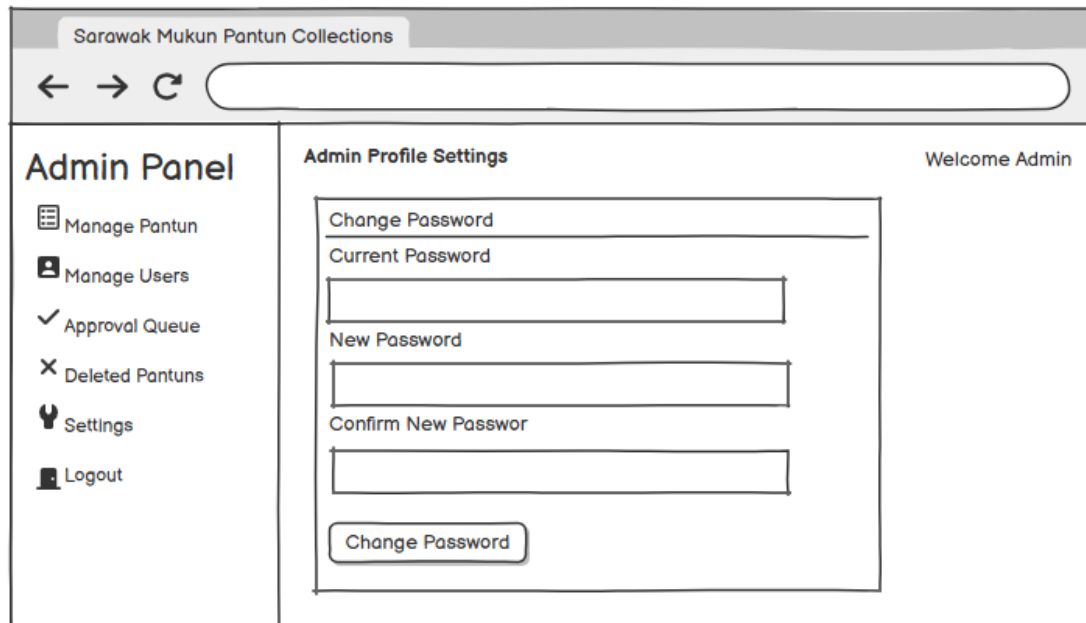


Figure 36. Admin Panel - Admin Profile Settings Page

In Figure 36, the admin profile settings page enables administrators to update their account details, including personal information and security settings. This functionality ensures that admin accounts remain current and secure, supporting best practices in system administration. The layout is user-friendly, minimizing friction during updates.

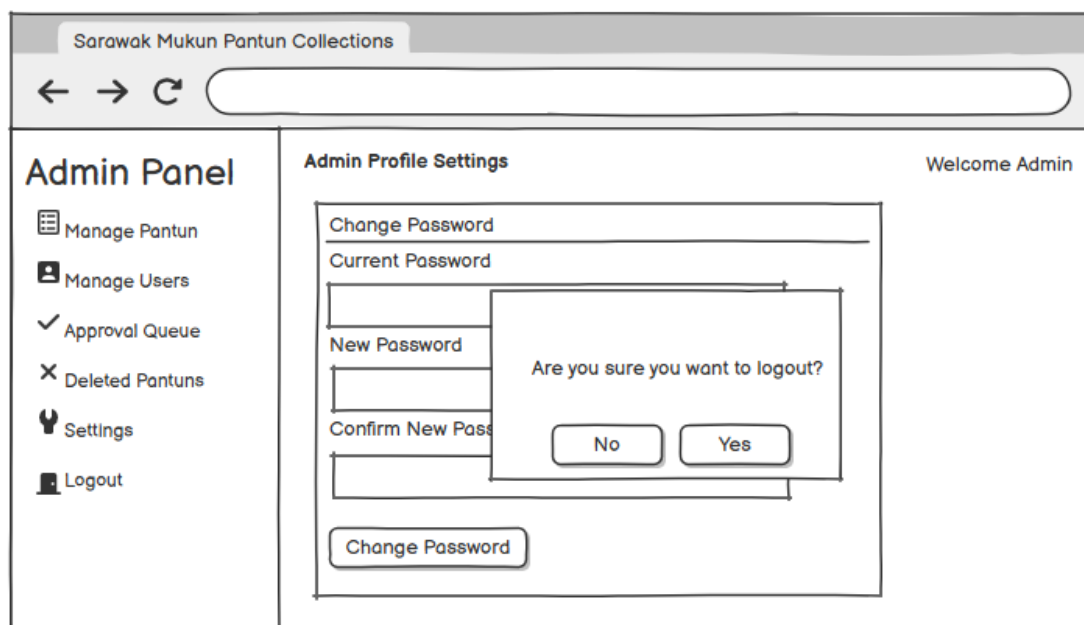


Figure 37. Admin Panel - Logout Pop-up

In Figure 37, the logout pop-up confirms the administrator's intent to sign out of the system. It serves as a safeguard against accidental logout actions, maintaining session integrity. This

minor yet crucial interaction improves the overall user experience by reinforcing intentional navigation within the system.

These mock-ups are great illustrations of the system's orientation towards the users and their needs in the interaction. In this way, the interface's design also assists in the preservation and future availability of the invaluable cultural legacy of Mukun pantun by providing clear pathways for input, organization, and retrieval of pantun.

Data Dictionary

A data dictionary is a structured reference that details the organization, attributes, and definitions of variables within a dataset (Rashid et al., 2020). It plays a vital role in ensuring reproducibility by providing clarity and understanding of the data for other users. In the context of this report, the data dictionary focused more for this project on Harnessing Digital Archives for the Conservation of Sarawak's Mukun Pantun. The data dictionary plays a crucial role in establishing consistency, clarity, and structure in the system's database design. It ensures that all parties involved have a common understanding of the stored data, and it supports the development, maintenance, and future scalability of the system. The system comprises three primary database tables: admin, pantun, and users, each designed to support different functional requirements of the digital archiving system.

Table 9.
Data Dictionary for Admin Table

Field Name	Data Type	Description	Constraints
id	Int (11)	Primary key for the admin record	Not null, primary key
username	Varchar (50)	Username of the admin	Not null
password	Varchar (250)	Hashed password	Not null
created_at	Timestamp	Timestamp of account creation	Not null, Default current_timestamp()
last_login	Timestamp	Last login timestamp	Null, Default Null

The admin table as shown in Table 9 is designed to manage the authentication and profile information of administrators who are responsible for maintaining the pantun database and system settings. This table includes several key attributes such as id, username, password, email, created_at, and last_login.

The id field acts as the primary key and uniquely identifies each administrator in the system. It is defined as an integer with an auto-increment constraint to ensure sequential and non-repetitive assignment. The username and email fields are of type VARCHAR and are designated as unique, thereby preventing duplicate administrator accounts. The password field stores hashed password values for security purposes. The created_at field captures the timestamp of when the administrator account was created, while the last_login field records the most recent login timestamp. These fields collectively ensure secure, auditable, and efficient administrative control over the system.

Table 10.
Data Dictionary for pantun table

Field Name	Data Type	Description	Constraints
p_id	Int (11)	Primary key for each pantun	Not null, primary key
line 1	Varchar (255)	First line of the pantun	Nullable
line 2	Varchar (255)	Second line of the pantun	Nullable
line 3	Varchar (255)	Third line of the pantun	Nullable
line 4	Varchar (255)	Fourth line of the pantun	Nullable
category	Varchar (100)	Category of the pantun (e.g. Kasih Sayang, Jenaka)	Nullable
status	Enum	Status of the pantun (Pending, Approved, Rejected)	Default 'Pending'
deleted_at	Timestamp	Timestamp of soft delete (NULL if not deleted)	Nullable
submitted_by	Varchar (100)	Identifier of the user who submitted the pantun	Nullable
submitted_at	Timestamp	Timestamp of submission	Not null, Default current timestamp()
reviewed_by	Varchar (100)	Reviewer's identifier	Nullable
reviewed_at	Timestamp	Timestamp when the pantun was reviewed	Nullable

Table 10 represents the core content repository within the system, storing all pantun entries submitted or archived. Key attributes include id, line 1, line 2, line 3, line 4, category, status,

deleted_at, submitted_by, submitted_at, reviewed_by, and reviewed_at. The id was set as the primary key and is auto-incremented to maintain uniqueness. The four line fields, line 1 until line 4, correspond to the four lines of a pantun and are stored as VARCHAR data types. The category field classifies each pantun according to traditional and thematic categories such as Pantun Kasih Sayang, Pantun Nasihat, etc., which are important for organization and search functionality. The status field, represented as an ENUM, indicates the review state of each pantun. It can be set to Pending, Approved, or Rejected, with new submissions automatically marked as Pending. The fields submitted_by and submitted_at capture who submitted the pantun and when, while reviewed_by and reviewed_at keep track of who reviewed it and the time of that review. This setup ensures that we can trace the content effectively. Additionally, the deleted_at field allows for soft deletion, meaning entries can be marked as removed without being permanently deleted. If this field is NULL, it means the record is still active.

Table 11.
Data Dictionary for users table

Field Name	Data Type	Description	Constraints
id	Int (11)	Unique identifier for each user	Not null, primary key, auto increment
email	Varchar (255)	User's email address	Not null, unique
name	Varchar (100)	Full name of the user	Not null
state	Varchar (100)	State or region (e.g., Sarawak) where the user resides	Nullable
sub-state	Varchar (100)	Subdivision or district (e.g., Kuching) within the state	Nullable
age	Int (11)	User's age	Nullable
password	Varchar (255)	Hashed user password	Not null
created_at	Timestamp	When the user account was created	Not null, default current_timestamp
updated_at	Timestamp	When the user record was last updated	Not null, default current_timestamp on update
status	Varchar (20)	Current status of the user account (e.g., active)	NOT NULL, DEFAULT 'active'

The users table in Table 11 is intended to store information about individuals who interact with the system. The table includes fields such as id, email, name, state, sub_state, age, password_hash, created_at, updated_at, status, reset_token, and reset_token_expires. The id is a unique identifier serving as the primary key. The email field, which must be unique, acts as the user's login identifier, while name, state, sub_state, and age capture demographic and location-specific data that may be useful for analysis. The password_hash field securely stores user credentials using encryption. The created_at and updated_at fields allow for tracking account creation and modification activities. The status field indicates the user's current account status (e.g., active or inactive).

3.2.4.4 Implementation

The implementation phase of the project focuses on implementing the proposed digital archive system and integrating all components. This stage includes the configuration of the backend, developing of the frontend, and ensuring proper connection of the database with the website. The choice of system development will use 'WordPress' framework in view of the fact that it is simpler and more flexible for creating dynamic websites. For hosting the system, the InfinityFree web hosting service will be utilized as it offers free and reliable hosting for testing and production. Initially, a subdomain provided by InfinityFree will be used for this purpose with an option to use a more accessible custom domain such as '.com' or '.org'. MySQL, which is a popular relational database management system, will be the mode of implementation of the backend database to enable efficient storage and management of the pantun data. The MySQL database application will be enabled to work with the WordPress framework for smooth operation and interaction between the data and the user interface.

Integrating these tools and technologies would allow the system to be built as a usable system within Sarawak's Mukun pantun for preservation and searching purposes as specified in the functional and user requirements in the preceding stages.

3.2.4.5 System Testing

System testing focuses on ensuring that the digital archive meets its intended objectives through Functional Testing and User Acceptance Testing (UAT). UAT involves inviting selected users, such as researchers, cultural enthusiasts, and students, to interact with the platform and provide feedback on its usability, functionality, and overall user experience. Their feedback will help validate that the system meets user expectations and achieves its goals.

Functional Testing ensures that all features, including pantun search, categorization, and contribution functionalities, operate as intended. Each functionality will be rigorously tested to identify and resolve any issues or bugs. These tests ensure that the system is reliable and ready for deployment.

3.2.4.6 System Deployment

The final stage involves deploying the digital archive to a live environment, making it accessible to users. The deployment process includes setting up the web server, configuring the database, and ensuring all system components are integrated seamlessly. Before the final launch, a beta testing phase will be conducted with a limited group of users to gather feedback and resolve any unforeseen issues. Once the system passes all evaluations, it will be properly launched and made accessible to the target audience. Post-deployment support and maintenance plans will be established to address any technical issues and implement future updates to enhance the system's functionality and user experience.

3.2.5 Stage 5: System Evaluation

Following the development of the platform, a system evaluation will be carried out to measure its overall effectiveness and efficiency.

Purpose of Evaluation

The goal is to assess the usability, functionality, and effectiveness of the digital archive system in enabling users to search for and find appropriate responses to specific pantun. The website's usability will be assessed to ensure it is user-friendly, intuitive to navigate, and aligns with user expectations. The evaluation will also focus on testing the cataloguing feature's precision, speed, and ability to accurately sort and retrieve relevant pantun based on user input. User feedback regarding the platform's design and functionality will be gathered, and any identified issues will be addressed to enhance user satisfaction.

Evaluation Framework

The performance evaluation will involve both User Acceptance Testing (UAT) and the System Usability Scale (SUS) to achieve the goals of the system evaluation in a manner that is both valid and reliable.

User Acceptance Testing (UAT)

UAT serves as a critical phase to ascertain whether the system aligns with user expectations and functional requirements. This testing primarily focuses on evaluating the system's ease of finding information, its overall usability aspects, and its adherence to predefined user requirements. Through UAT, participants engage with the system in simulated real-world scenarios, providing qualitative feedback essential for identifying potential weaknesses and confirming the system's readiness for implementation. This feedback is crucial for discovering unforeseen issues and validating that the system delivers on its intended purpose from an end-user perspective.

System Usability Scale (SUS)

The System Usability Scale (SUS), developed by John Brooke in 1986, represents a widely adopted instrument for quantitatively assessing the perceived usability of diverse systems, encompassing websites, software applications, and hardware interfaces (Tullis & Albert, 2013). This psychometric tool comprises 10 distinct statements, each evaluated by participants on a 5-point Likert scale ranging from "strongly disagree" to "strongly agree." To mitigate potential response biases, the scale strategically alternates between positively and negatively worded items. Subsequent to data collection, participant responses are subjected to a standardized computational formula, yielding a composite score ranging from 0 to 100. This resultant score functions as a singular, comprehensive metric that encapsulates users' holistic perception of a system's overall usability (Tullis & Albert, 2013).

Table 12.

SUS Score Interpretation

SUS Score	Grade	Adjective Rating
>80.3	A	Excellent
68-80.3	B	Good
68	C	Okay
51-68	D	Poor
< 51	F	Awful

Alathas (2018) proposes a categorical interpretation of SUS scores, as detailed in Table 12. Table 12 presents a common interpretation framework for SUS scores, categorizing them into grades and adjective ratings. A score exceeding 80.3 is considered "Excellent" (Grade A),

indicating a highly usable system. Scores between 68 and 80.3 are rated as "Good" (Grade B), suggesting acceptable usability with room for minor improvements. A score of exactly 68 falls into the "Okay" category (Grade C), representing a borderline acceptable level of usability. Scores ranging from 51 to 68 are deemed "Poor" (Grade D), highlighting significant usability issues that require attention. Finally, scores below 51 are classified as "Awful" (Grade F), signifying critical usability problems that severely hinder user interaction. This interpretive framework allows for a clear and concise understanding of a system's usability performance, guiding design and development efforts toward user-centred improvements.

In this stage, UAT and the SUS concentrate on the user experience and feedback. The evaluation collected will therefore assist in establishing areas that require enhancement and guarantee that the system designed responds to user requirements and cultural preservation. Refer to Appendix B for feedback questions for system evaluation.

Participant Selection

The participants selected for the evaluation process include individuals familiar with Sarawak's Mukun Pantun, such as local community members, cultural practitioners, researchers, and students. This diverse group ensures that the evaluation reflects the perspectives of both technical and non-technical users. A sample size of 15–20 participants is deemed sufficient to capture a broad range of feedback and insights. Participants will be recruited through personal networks, cultural organizations, and educational institutions.

Task Scenarios

To evaluate the system's functionality and usability, participants will complete a series of predefined tasks designed to simulate real-world interactions with the digital archive. These tasks include searching for a specific pantun, interpreting the retrieved content, contributing a new pantun to the archive, and browsing the collection. Each task is structured to test specific features of the system, such as its search algorithms, user interface design, and data contribution mechanisms. Table 13 provides a detailed outline of the evaluation tasks.

Table 13.
Task Scenarios for evaluation

Task No.	Description	Objective
----------	-------------	-----------

1.	Search for a specific pantun based on keywords/categories.	To evaluate the search accuracy and relevancy.
2.	Find a response for the searched pantun.	To test the response function for accuracy and relevancy.
3.	Add a new pantun to the digital archive.	To test the functionality of the contribution feature.
4.	Browse the archive to explore other pantuns.	To analyse the system's navigation and ease of use.

In Table 13, in this stage, UAT and functional testing concentrates on the user experience and feedback. The evaluation collected will therefore assist in establishing areas that require enhancement and guarantee that the system designed responds to user requirements and cultural preservation. Refer to Appendix B for feedback questions for system evaluation.

3.2.6 Stage 6: Documentation

The final stage involves comprehensive documentation of the research process, including methodologies employed, challenges encountered, and solutions implemented. The evaluation results and user feedback are also documented to provide insights into the system's performance. The documentation addresses the challenges encountered during the project and outlines the strategies employed to resolve them. Additionally, the results of evaluations and user feedback are highlighted, offering an assessment of the platform's performance and suggestions for improvement. This documentation can serve as a resource for future researchers and contributes to the broader field of cultural preservation through digital archiving.

Hardware Requirement

Table 14.
Hardware Requirement for the Proposed System

No.	Hardware	Specifications
1.	CPU	Intel Core i5
2.	RAM	4GB
3.	Operating System	Windows 10 (64-bits)

Software Requirement

Table 15.
Software Requirement for the Proposed System

No.	Software	Requirement
1.	Web Hosting	InfinityFree
2.	Framework	WordPress
3.	Database	MySQL
4.	Web Domain	InfinityFree subdomain or custom domain (e.g., ".com" or ".org").
5.	Web Browser	Google Chrome, Microsoft Edge, Firefox, Safari, Opera.

3.3 Summary

This chapter provided a detailed account of the research methodology, outlining the six stages of the study. The structured approach ensures the successful development and evaluation of a digital archive for the conservation of Sarawak's Mukun pantun, contributing to the preservation of this invaluable cultural heritage for future generations.

Chapter 4: Implementation

4.1 Introduction

This chapter describes the development process of the digital archive system for preserving Sarawak's Mukun Pantun. It details the hardware and software environment used, the setup of development tools, the design of user roles, and the system's core functionalities. The system was developed using PHP and MySQL within the XAMPP stack, and designed in accordance with the requirements and design outlined in Chapter 3.

The hardware and software specifications used to develop the web-based digital archive system are outlined in Table 16 below:

Table 16.
Hardware and Software Specifications

Component	Specification
CPU	Intel Core i5 2.4GHz
RAM	16GB
Operating System	Windows 10 (64-bit)
IDE	Visual Studio Code
Web Server	XAMPP (Apache + MySQL + PHP)
Database	phpMyAdmin (MySQL)
Front-End	HTML, CSS, JavaScript
Browser	Google Chrome

4.2 Environment Setup

This section outlines the configuration of the tools used to develop the Mukun Pantun archive system.

4.2.1 XAMPP

XAMPP is an open-source, cross-platform web server solution package developed by Apache Friends. It provides an easy-to-use control panel and includes Apache (HTTP server), MySQL (database server), and interpreters for PHP and Perl. XAMPP was installed to simulate a server environment on the local machine, allowing the system to be developed and tested without needing an internet-hosted server. Once installed, the Apache and MySQL modules were activated. XAMPP was installed as the local development environment. It includes Apache (web server), MySQL (database), and PHP (server-side scripting). After installation, the

Apache and MySQL modules were activated using the XAMPP control panel as shown in Figure 38 below.

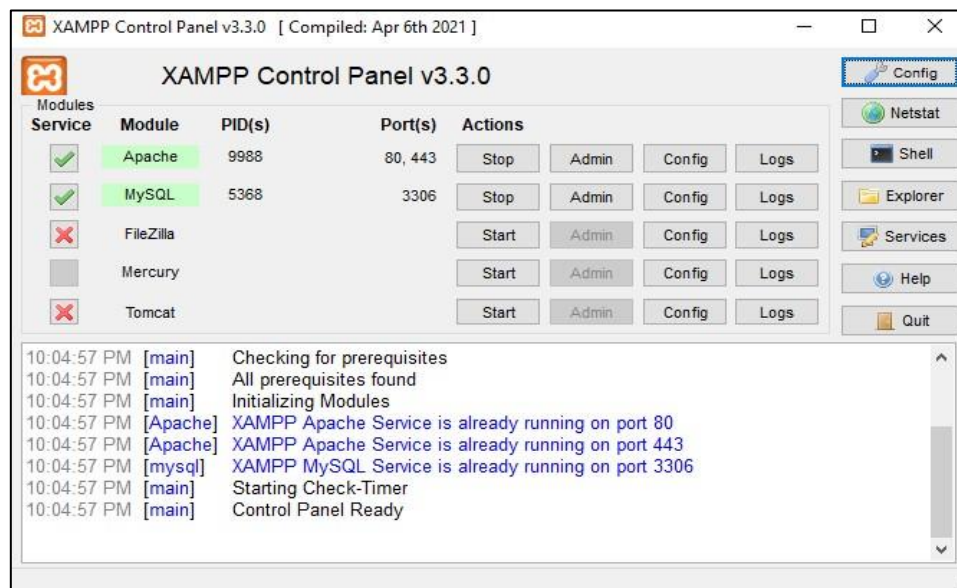


Figure 38. *XAMPP Control Panel*

4.2.2 phpMyAdmin

phpMyAdmin is a web-based MySQL administration tool included with XAMPP. It was used to manage the MySQL database, where all pantun data, user accounts, categories, and system logs are stored. The database was designed following a relational model, with foreign key constraints and indexed fields to improve performance and ensure data integrity. The db_mukunpantun database was created, consisting of several tables such as users, pantun, and users. phpMyAdmin enabled simple import/export of data, query testing, and user privilege management.

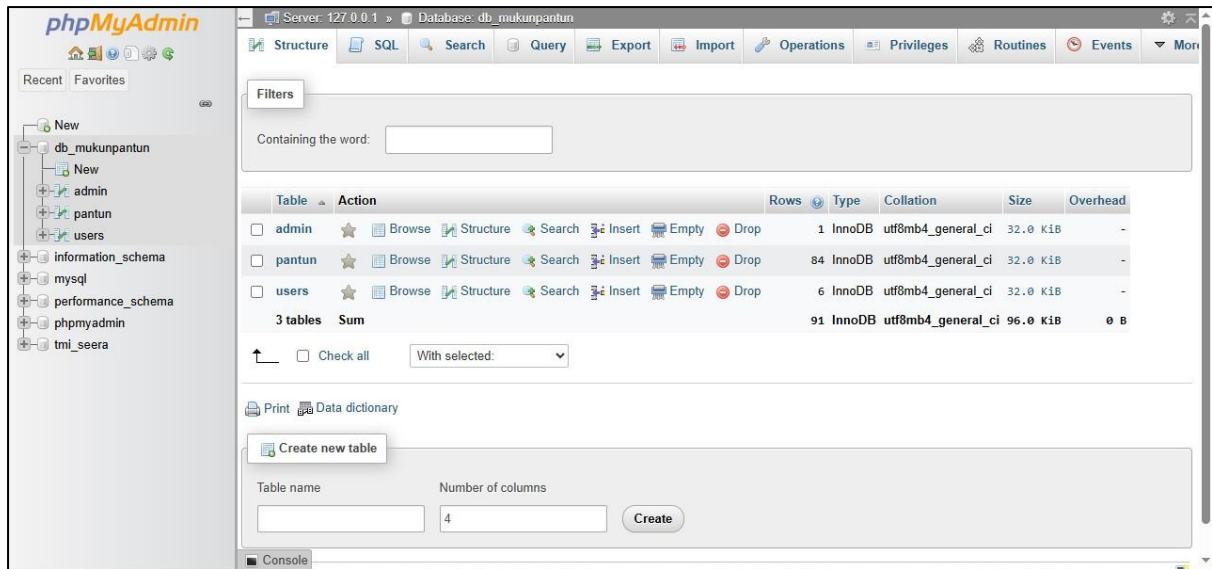


Figure 39. *phpMyAdmin Interface*

4.2.3 Visual Studio Code

Visual Studio Code (VS Code) served as the primary Integrated Development Environment (IDE) for developing the system. It was chosen due to its flexibility, support for PHP development, and extension ecosystem.

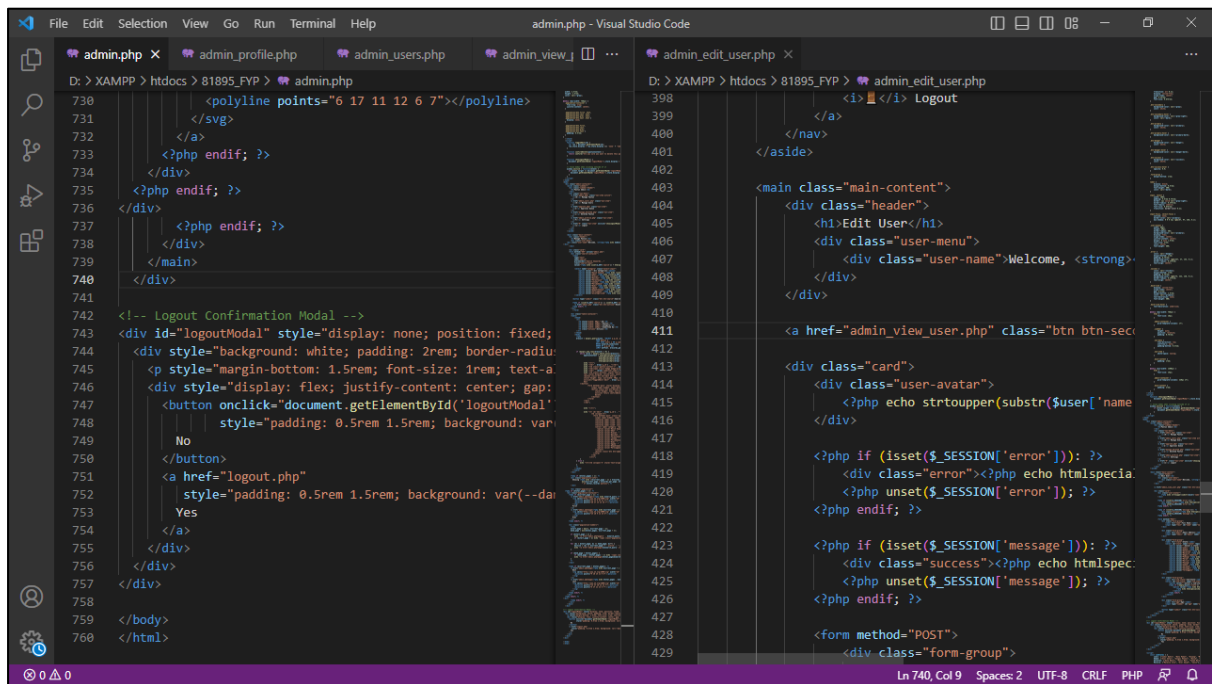


Figure 40. *Visual Studio Code Interface*

4.3 Role-Based Access

Role-based access control (RBAC) was implemented to manage user interactions according to their role in the system. This ensures secure and relevant functionality for each type of user.

4.3.1 Public Users

Visitors who have not registered or logged in can browse the digital pantun collection and perform keyword searches. However, their access is limited as they cannot contribute pantun or manage content. This role was introduced to promote open access while preserving data integrity.

4.3.2 Registered Users

Once registered and logged in, users can upload their own pantun, manage their contributions, and view their profile information. This role encourages public engagement, especially from pantun enthusiasts, researchers, and students. Their contributions are subject to admin approval before being published, maintaining quality and cultural accuracy.

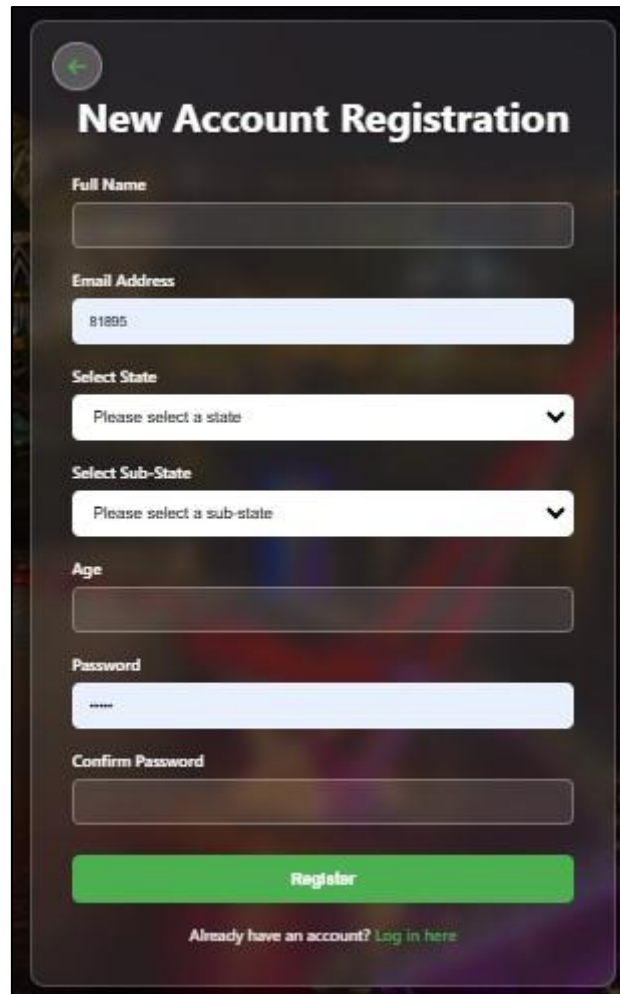
4.3.3 Admin

Administrators have full access to all functionalities, including user management, content moderation, and system configuration. They are responsible for approving new pantun submissions, managing deleted or flagged content, and ensuring the overall integrity of the archive. All newly donated pantun will be validated by an admin to ensure correct spelling, appropriateness, and authenticity as original Sarawak pantun. Admin users also oversee system settings such as category management and platform behaviour.

4.4 Functions of Web Portal

This section describes the main features available to end users and contributors within the platform.

4.4.1 Registration



The image shows a mobile application interface for a 'New Account Registration' page. At the top left, there is a green circular button with a white left-pointing arrow. The title 'New Account Registration' is displayed in a bold, white font. Below the title, the form consists of several input fields: 'Full Name' (a dark grey text box), 'Email Address' (a light blue text box containing the text '81895'), 'Select State' (a white dropdown menu with the text 'Please select a state' and a downward arrow), 'Select Sub-State' (a white dropdown menu with the text 'Please select a sub-state' and a downward arrow), 'Age' (a dark grey text box), 'Password' (a light blue text box with masked characters '*****'), and 'Confirm Password' (a dark grey text box). At the bottom of the form is a prominent green button labeled 'Register' in white text. Below this button, there is a link that says 'Already have an account? Log in here' in a smaller, lighter green font.

Figure 41. *Registration Page*

Figure 41 illustrates that new users are required to fill in a form that collects information such as name, email address, state, sub-state, age and password. Form validation is implemented to ensure data correctness and avoid duplicate entries. Upon successful registration, the user can log in and access contributor features.

4.4.2 Login

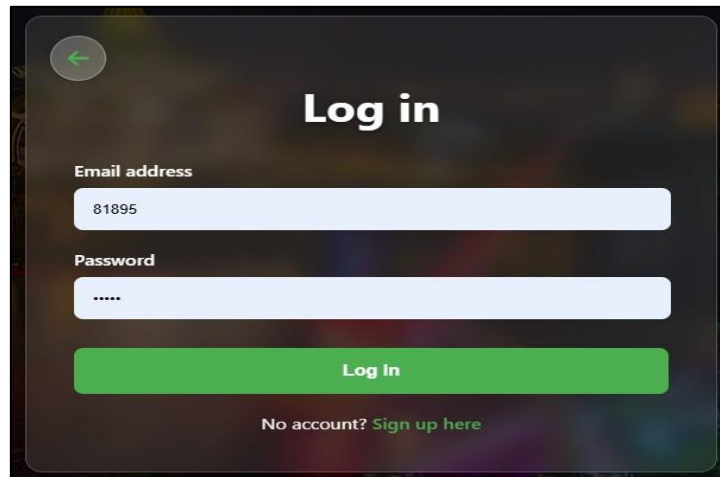


Figure 42. *User Login Page*

In Figure 42, the login page authenticates users via email and password credentials. Upon successful authentication, the user is redirected to a dashboard appropriate to their role (user or admin). A session is created to maintain secure access.

4.4.3 Main Page

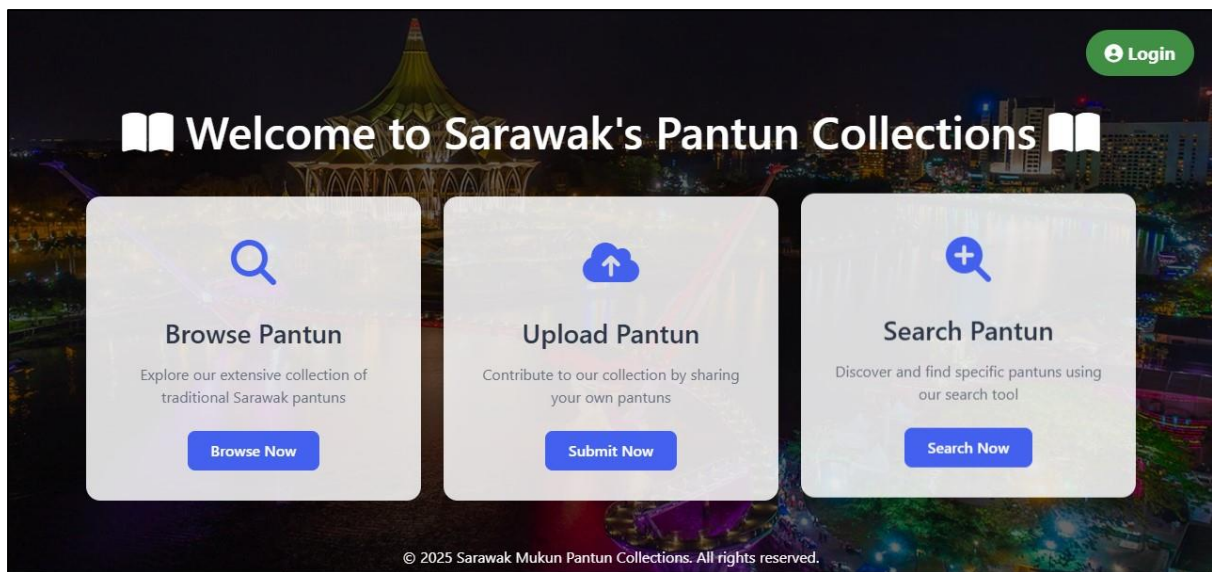


Figure 43. *Main Page of the website*

As shown in Figure 43, the main page functions as the landing area for users. It displays navigation options, highlighted pantun categories, and links to featured or newly uploaded pantun. It acts as the central hub for interaction.

4.4.4 Browse Pantun



Figure 44. *Browse Pantun Page*

In Figure 44, users can navigate through categorized pantun entries in this section. Pantun are grouped into themes (e.g., love, advice, nature), allowing for easier exploration. To find the response to a pantun, users can click on the pantun, and the corresponding response will appear on the right side as shown in Figure 45. Pagination and filtering options are implemented for usability.

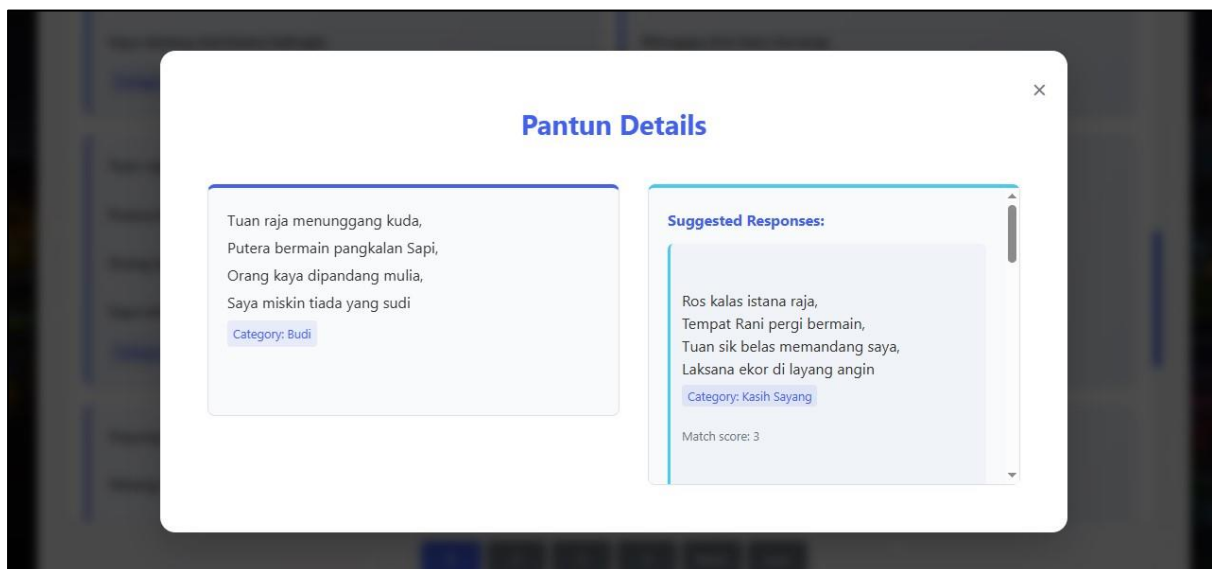


Figure 45. *Pantun Response Pop-up*

In Figure 45, the system automatically generates a suggested reply pantun using a simple recommender system based on a scoring method.

4.4.5 Upload Pantun

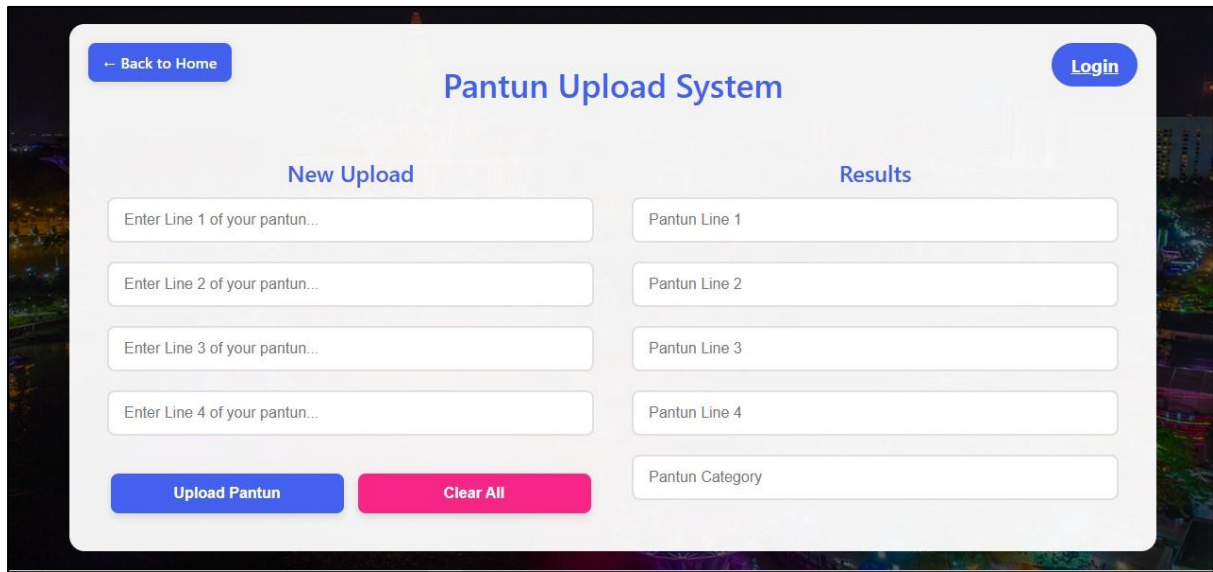
The screenshot shows the 'Pantun Upload System' interface. At the top left is a 'Back to Home' button, and at the top right is a 'Login' button. The main title 'Pantun Upload System' is centered. Below the title, there are two columns: 'New Upload' and 'Results'. The 'New Upload' column contains four text input fields labeled 'Enter Line 1 of your pantun...', 'Enter Line 2 of your pantun...', 'Enter Line 3 of your pantun...', and 'Enter Line 4 of your pantun...'. Below these fields are two buttons: 'Upload Pantun' (blue) and 'Clear All' (pink). The 'Results' column contains four text input fields labeled 'Pantun Line 1', 'Pantun Line 2', 'Pantun Line 3', and 'Pantun Line 4', followed by a 'Pantun Category' input field.

Figure 46. *Upload Pantun Page*

In Figure 46, this feature allows registered users to contribute new pantun. Public users are not allowed to upload any pantun to the database. The form requires four lines of text. Upon submission, the pantun goes through an auto-categorization phase and awaits admin approval before appearing on the public site. The pantun is automatically classified into one of 11 themes using a simple corpus and scoring method.

4.4.6 Search Pantun

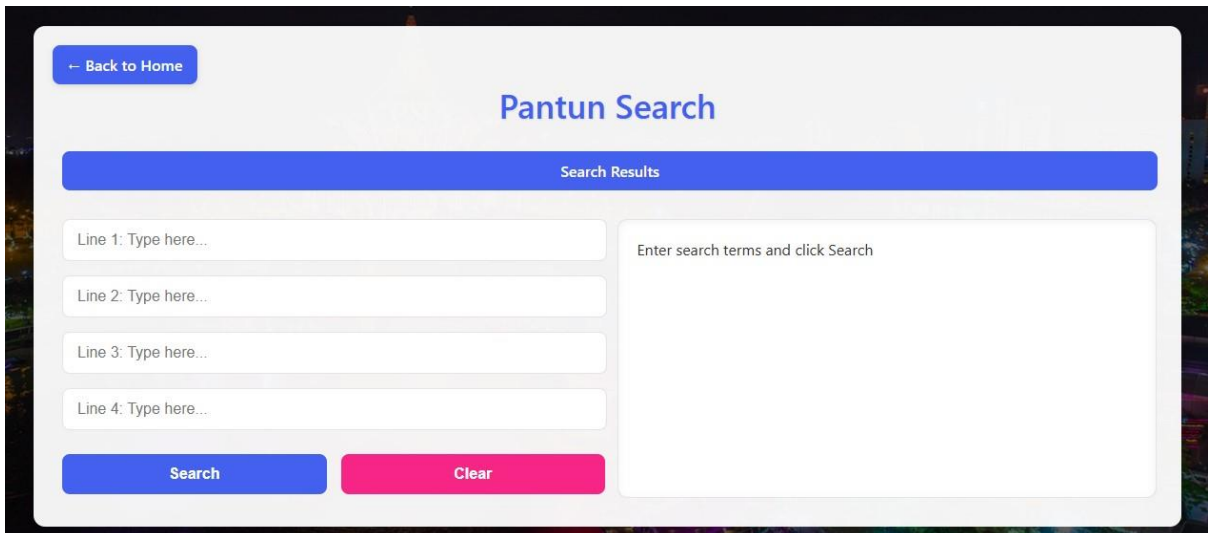
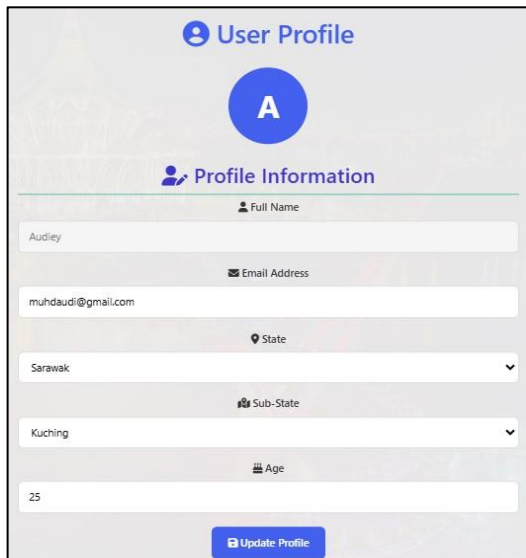
The screenshot shows the 'Pantun Search' interface. At the top left is a 'Back to Home' button. The main title 'Pantun Search' is centered. Below the title, there is a blue bar labeled 'Search Results'. On the left side, there are four text input fields labeled 'Line 1: Type here...', 'Line 2: Type here...', 'Line 3: Type here...', and 'Line 4: Type here...'. Below these fields are two buttons: 'Search' (blue) and 'Clear' (pink). On the right side, there is a large text area with the placeholder text 'Enter search terms and click Search'.

Figure 47. *Pantun Search Page*

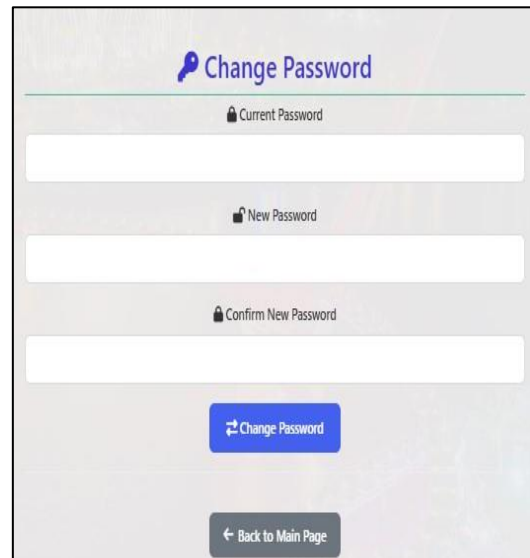
In Figure 47, users can search pantun using keywords. The system matches queries against the database by matching the keywords or full-text search, depending on the input. Users may also trigger the function that suggests appropriate responses to the searched pantun.

4.4.7 User's Profile



The 'User Profile' form features a header with a user icon and the title 'User Profile'. Below this is a circular profile picture placeholder containing the letter 'A'. The main section, titled 'Profile Information', contains several input fields: 'Full Name' (with the value 'Audley'), 'Email Address' (with the value 'muhdaudi@gmail.com'), 'State' (a dropdown menu with 'Sarawak' selected), 'Sub-State' (a dropdown menu with 'Kuching' selected), and 'Age' (with the value '25'). An 'Update Profile' button is located at the bottom right of the form.

Figure 48. *Profile Update*



The 'Change Password' form has a header with a key icon and the title 'Change Password'. It contains three input fields: 'Current Password', 'New Password', and 'Confirm New Password'. A blue 'Change Password' button is positioned below the 'Confirm New Password' field. At the bottom of the form is a grey 'Back to Main Page' button.

Figure 49. *Password Update*

Users have a dedicated profile page displaying their details as shown in Figure 48 and Figure 49. They can edit their personal information such as their email, state, sub-state, age, and update their password.

4.4.8 User's Contribution

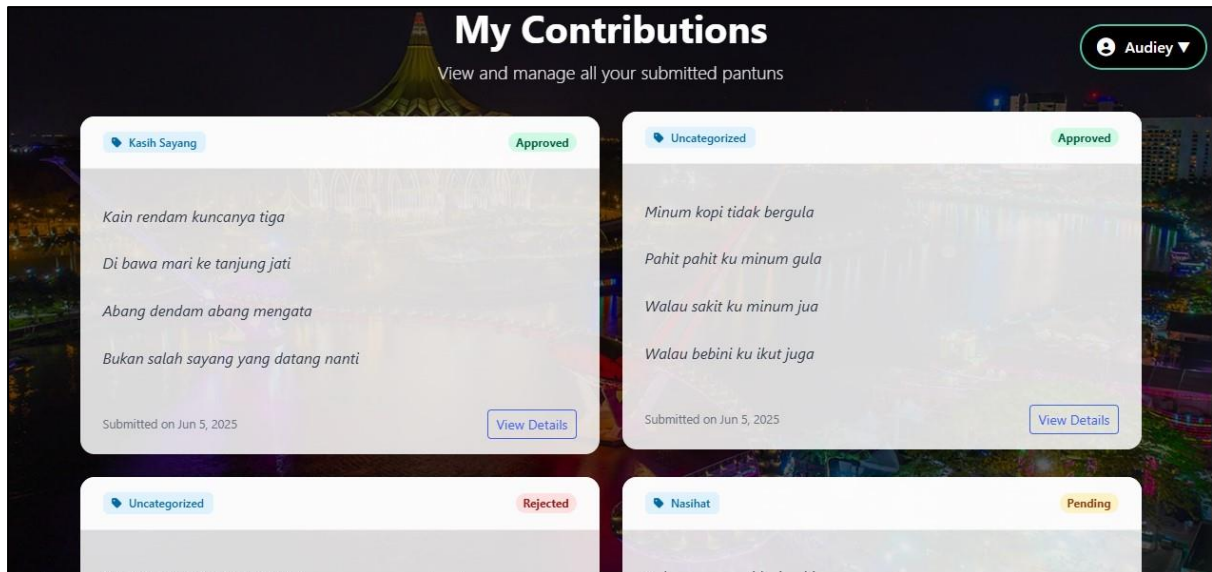


Figure 50. User Contribution Page

In Figure 50, this page displays a history of pantun submissions by the logged-in user. Each entry shows its approval status (pending, approved, rejected) and the date of upload. It provides transparency and encourages active participation.

4.5 Admin Access

The administrative dashboard offers full control over the system's content and userbase. This section covers each function available exclusively to admin.

4.5.1 Manage Pantun

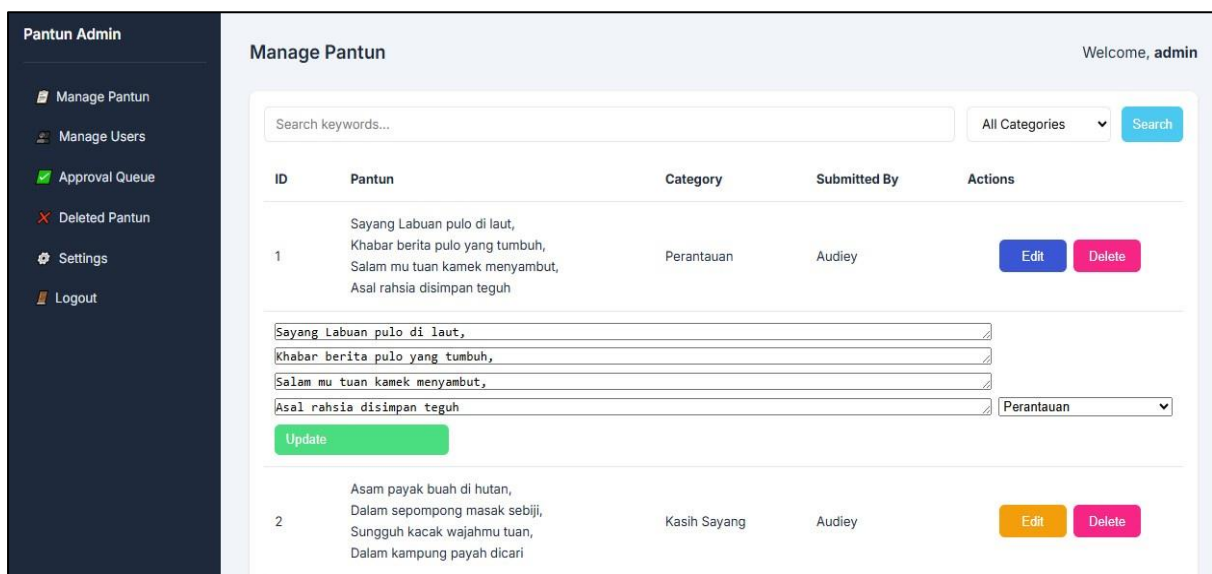


Figure 51. Manage Pantun Page

Admins can view all pantun entries submitted to the system. As shown in Figure 51, they may edit incorrect lines, reassign categories, or delete entries if deemed inappropriate. All newly donated pantun will be validated by an admin to ensure correct spelling, appropriateness, and authenticity as original Sarawak pantun.

4.5.2 Manage User

ID	Name	Email	State	Sub State	Age	Joined	Status	Actions
1	Audley	muhdaudi@gmail.com	Sarawak	Kuching	25	May 20, 2025	Active	View Edit Deactivate
2	John Doe	johndoe@gmail.com	Sarawak	Sibu	20	May 22, 2025	Active	View Edit Deactivate
4	Dj Khalid	djkhalid@gmail.com	Sarawak	Betong	52	May 22, 2025	Active	View Edit Deactivate
5	Zelda	zelda@gmail.com	Sarawak	Bintulu	30	May 23, 2025	Active	View Edit Deactivate
6	Zulaika	Zulaika@gmail.com	Kedah	Alor Setar	32	May 26, 2025	Active	View Edit Deactivate
7	Siti	Siti@gmail.com	Terengganu	Dungun	40	May 26, 2025	Active	View Edit Deactivate

Figure 52. *Manage User Page*

This section lists all registered users as shown in Figure 52. Admins may suspend accounts, reset passwords or edit their details if necessary. Admins can also review users' contributions for accountability.

4.5.3 Pantun Approval

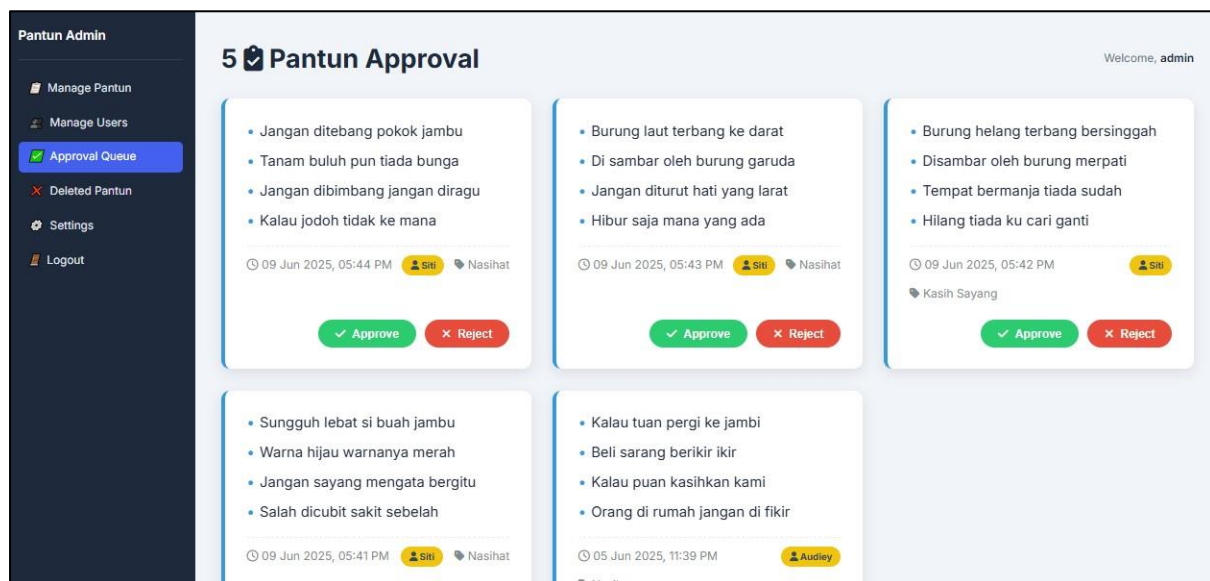


Figure 53. *Pantun Approval Page*

In Figure 53, newly uploaded pantun will appear in a pending queue. Admins can review each entry, verify its quality and authenticity, and approve it for publication. They may also reject submissions if the pantun is not appropriate.

4.5.4 Deleted Pantun



Figure 54. *Deleted Pantun Page*

In Figure 54, this section logs all removed pantun entries. Admins can restore entries if deleted accidentally or archive them permanently. This feature provides administrative oversight and recoverability.

4.5.5 Settings

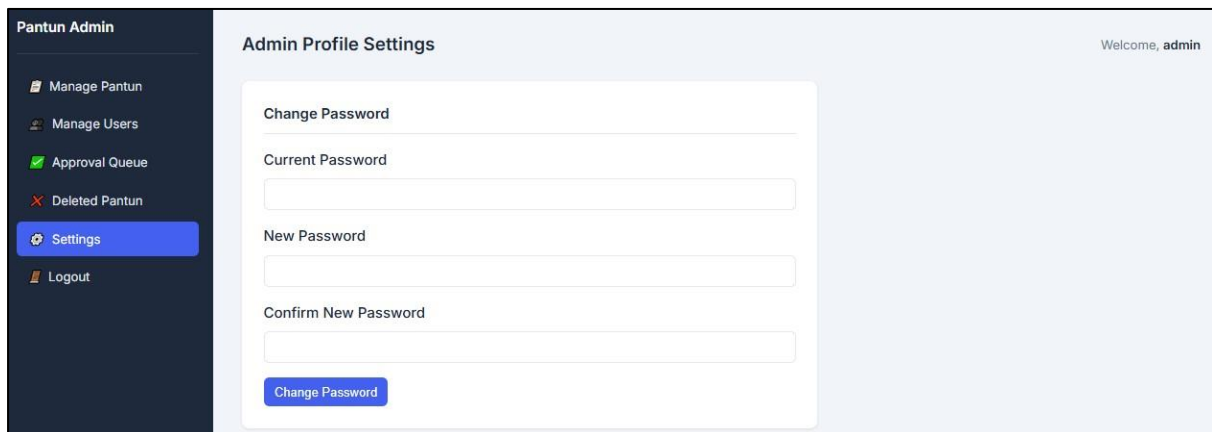


Figure 55. *Admin Settings Page*

In Figure 55, this page allows admin to change and update their password if the need to.

4.5.6 Logout

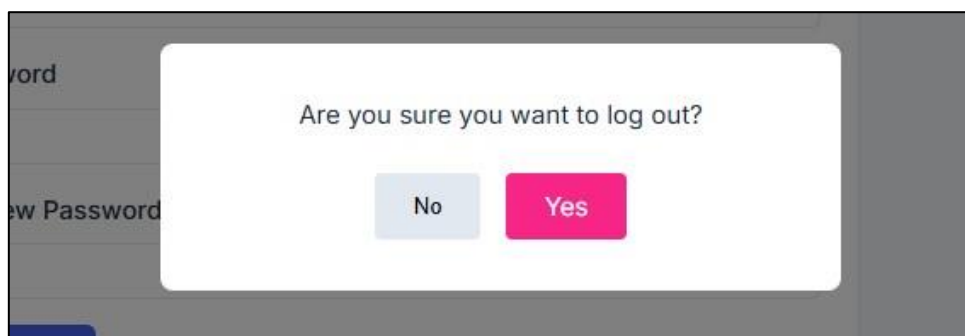


Figure 56. *Logout Confirmation*

A logout confirmation will pop-up when admin clicks logout button as shown in Figure 56.

4.6 Data Collections and Sources

The pantun data used in this project was collected from a variety of publicly available digital platforms to ensure diversity in linguistic style, theme, and expression. One of the primary sources was personal and community blogs, particularly from Blogspot, where traditional and modern pantuns are often shared by hobbyists, educators, and cultural enthusiasts. These blog posts typically feature pantuns that reflect local wisdom, values, and humour, making them valuable for linguistic and semantic analysis. Additionally, user-generated content on platforms such as YouTube and TikTok was also utilized. On YouTube, pantuns were gathered from video through spoken content, especially in educational, cultural, or performance-based videos. TikTok, on the other hand, provided short-form pantuns often presented in creative or

humorous formats, reflecting contemporary language use and informal expressions. These multiple sources allowed the system to analyse pantuns across different contexts and tones, contributing to a richer dataset for classification and scoring development.

4.7 Development of Scoring for Pantun Responses

One of the key features in this project is the implementation of an automated scoring mechanism to suggest appropriate pantun responses. This functionality is essential in preserving the dialogic and responsive nature of Mukun pantun performances, where participants traditionally reply to one another using thematically or semantically related verses. The proposed system aims to replicate this interaction digitally by analysing the pantun content and identifying the most relevant replies stored in the database.

Table 17.
browse.php code

browse.php
<pre>// Function to find matching pantuns based on keywords function findMatchingPantuns(\$conn, \$currentPantunId, \$keywords, \$limit = 5) { // Get all approved pantuns except the current one \$query = "SELECT p_id, line1, line2, line3, line4, category FROM pantun WHERE status = 'Approved' AND deleted_at IS NULL AND p_id != ?"; \$stmt = \$conn->prepare(\$query); \$stmt->bind_param("i", \$currentPantunId); \$stmt->execute(); \$result = \$stmt->get_result(); \$allPantuns = []; while (\$row = \$result->fetch_assoc()) { \$allPantuns[] = \$row; } // Calculate scores for each pantun \$scoredPantuns = []; foreach (\$allPantuns as \$pantun) { \$pantunText = \$pantun['line1']." ".\$pantun['line2']." ".\$pantun['line3']." ".\$pantun['line4']; \$pantunKeywords = extractKeywords(\$pantunText, \$GLOBALS['malayStopWords']); // Calculate match score \$score = count(array_intersect(\$keywords, \$pantunKeywords));</pre>

```

        if ($score > 0) {
            $scoredPantuns[] = [
                'pantun' => $pantun,
                'score' => $score,
                'text' =>
                $pantun['line1']."\n".$pantun['line2']."\n".$pantun['line3']."\n".$pantun['line4'],
                'category' => $pantun['category']
            ];
        }
    }

    // Sort by score (descending)
    usort($scoredPantuns, function($a, $b) {
        return $b['score'] - $a['score'];
    });

    // Return top N matches
    return array_slice($scoredPantuns, 0, $limit);
}

```

In Table 17, the `findMatchingPantuns` function is responsible for finding and recommending pantuns that share similar content with a given pantun by analysing keyword overlap. It begins by retrieving all pantuns from the database that are marked as "Approved", not soft-deleted (i.e., where `deleted_at` IS NULL), and excluding the pantun currently being evaluated (identified by its ID). The function then loops through each of these pantuns, combines their four lines into a single string, and extracts meaningful keywords using the `extractKeywords` function excluding common Malay stop words via the global `$malayStopWords` list as shown in Table 18. It calculates a similarity score by counting how many of the current pantun's keywords appear in each of the other pantuns using the `array_intersect` function. Only pantuns with at least one shared keyword are considered as matches. These matches are stored along with their score, original text, and category. Before returning results, the function sorts all matches in descending order based on their scores, ensuring that pantuns with the highest number of keyword overlaps appear first. Finally, it returns a limited number of top-matching pantuns (default is 5), making the function effective for content-based pantun recommendation and retrieval.

Table 18.
Stopwords code function

browse.php
// Malay stop words list (simplified)

```

$malayStopWords = [
    'ada', 'adalah', 'ah', 'akan', 'akankah', 'akhir', 'amat', 'antara', 'apa',
    'apabila', 'atas', 'bagi', 'bahawa', 'banyak', 'baru', 'beberapa', 'begitu',
    'belum', 'berada', 'berapa', 'besar', 'boleh', 'bukan', 'bulan', 'cuma', 'dan',
    'dari', 'daripada', 'datang', 'dengan', 'di', 'dia', 'dua', 'dulu', 'empat',
    'hendak', 'ia', 'iaitu', 'ialah', 'ini', 'itu', 'jadi', 'jika', 'kali', 'kami',
    'kamu', 'karena', 'katanya', 'ke', 'kecil', 'kemudian', 'kepada', 'kini',
    'kira', 'kita', 'lagi', 'lain', 'lah', 'lain', 'lima', 'macam', 'mahu', 'maka',
    'mana', 'masa', 'masing', 'mempunyai', 'mulai', 'nanti', 'nya', 'oleh', 'orang',
    'pada', 'paling', 'per', 'pernah', 'pula', 'sama', 'sambil', 'sampai', 'sana',
    'sangat', 'satu', 'saya', 'se', 'sebab', 'sebagai', 'sebelum', 'sebuah',
    'secara', 'sedang', 'sejak', 'sekali', 'sekarang', 'seorang', 'seperti',
    'seratus', 'sesuatu', 'sudah', 'sungguh', 'tahun', 'telah', 'tentu', 'tentang',
    'terdapat', 'terhadap', 'tiap', 'tiba', 'tidak', 'tiga', 'untuk', 'wah', 'waktu',
    'yang'
];

// Function to extract keywords from pantun text
function extractKeywords($text, $stopWords) {
    // Combine all lines and convert to lowercase
    $combined = strtolower($text);

    // Remove punctuation
    $combined = preg_replace("/[^\p{L}\p{N}\s]/u", "", $combined);

    // Split into words
    $words = preg_split('/\s+/', $combined);

    // Remove stop words and short words (length < 3)
    $keywords = [];
    foreach ($words as $word) {
        $word = trim($word);
        if (!in_array($word, $stopWords)) { // Added closing parenthesis here
            if (mb_strlen($word) >= 3) {
                $keywords[] = $word;
            }
        }
    }
}

```

```

}
// Return unique keywords only
return array_unique($keywords);
}

```

The keyword extraction process is handled by the `extractKeywords()` function, as shown in Table 18. This function first converts the pantun text to lowercase to standardize casing, then removes any punctuation using regular expressions. The cleaned string is split into individual words (tokens), which are then filtered using a predefined list of common Malay stop words such as *yang*, *dan*, *adalah*, *itu*, etc. These stop words, while frequent in normal speech, do not contribute significant meaning in the context of thematic matching. Additionally, any words shorter than three characters are excluded to eliminate trivial tokens. Only unique and semantically relevant keywords are returned for further analysis.

Once keywords have been extracted for all candidate pantun entries, the system evaluates the relevance of each pantun as a response. This is done through a simple scoring algorithm where it calculates the number of overlapping keywords between the input pantun and each potential match. The greater the overlap, the higher the score. Pantun with a score of zero are excluded, while the remaining entries are sorted in descending order by score.

Finally, the top-scoring pantun which is limited to 5 responses are returned as the most suitable responses. These results are presented to the user through the system interface, allowing for a digital reenactment of a traditional *bermukun* exchange.

This keyword-based scoring system emphasizes lexical similarity, which, while computationally lightweight, is well-suited to the structured and metaphorical nature of pantun. By identifying common imagery, themes, or keywords across entries, the system allows for culturally rich and meaningful interactions that echo the traditional call-and-response format of Mukun performances.

4.8 Development of Scoring for Pantun Classification

The scoring mechanism for pantun responses plays a central role in evaluating their semantic relevance and categorization. The system is developed using PHP and relies on keyword-based scoring rules that are triggered during the upload and processing of pantun texts. The core logic

for this feature is distributed between two main files inside upload.php and process.php code files.

4.8.1 Overview of Scoring Workflow

The scoring process begins when a user submits a pantun through the web form, which is handled by upload.php. This file receives and stores the user-submitted data (including pantun lines and selected categories) into a MySQL database. After successful insertion, it redirects to process.php, where the actual scoring takes place.

4.8.2 Keyword-Based Scoring Function

The main scoring logic is found in process.php code file, where the system uses an associative array called \$category_keywords to define keyword-score pairs for each semantic category. Each word within a category is mapped to a numerical score from 1 to 5, representing its relevance or strength within that category. This is shown in Table 19 below:

Table 19.
process.php codes

process.php
<pre> \$category_keywords = ["Nasihat" => ["sabar" => 5, "usaha" => 4, "jujur" => 5, "taat" => 4, "rajin" => 3], "Jenaka" => ["ketawa" => 5, "lucu" => 4, "lawak" => 5, "gurau" => 3], // other categories...]; </pre>

Each time a keyword is found in the pantun text, the corresponding score is added to the total score for that pantun.

Table 20.
Scoring loop

```
foreach ($category_keywords as $category => $keywords) {
    $scores[$category] = 0;
    foreach ($keywords as $word => $weight) {
        $count = substr_count($text, $word);
        $scores[$category] += $count * $weight;
    }
}
arsort($scores);
$stopCategory = key($scores);
$stopScore = current($scores);
return $stopScore > 0 ? $stopCategory : "Uncategorized";
}
```

As shown in Table 21, this loop effectively creates a cumulative score that reflects how semantically aligned the pantun is with the selected category. The more relevant words appear in the pantun, the higher the total score.

4.8.3 Rhyme Checking

Table 21.
Rhyme Checking codes

```
// Function to check rhyme scheme
function checkRhymeScheme(line1, line2, line3, line4) {
    // Get last letters (converting to lowercase for comparison)
    const getLastLetter = (line) => {
        const trimmed = line.trim();
        return trimmed.charAt(trimmed.length - 1).toLowerCase();
    };

    const a = getLastLetter(line1);
    const b = getLastLetter(line2);
    const c = getLastLetter(line3);
```

```

const d = getLastLetter(line4);

// Check for A-A-A-A pattern
const isAAAA = a === b && b === c && c === d;

// Check for A-B-A-B pattern
const isABAB = a === c && b === d && a !== b;

return isAAAA ? 'AAAA' : isABAB ? 'ABAB' : 'INVALID';
}

```

As shown in Table 21, the checkRhymeScheme function is designed to identify the rhyme pattern of a pantun by examining the last letter of each line. It first trims each line to remove unnecessary spaces and converts the final character to lowercase for consistent comparison. It then checks for two common rhyme patterns: A-A-A-A (where all four lines end with the same letter) and A-B-A-B (where the first- and third-lines rhyme, and the second- and fourth-lines rhyme, but the two pairs are different). If neither pattern is detected, the function returns "INVALID", indicating that the pantun does not follow a recognizable rhyme structure. This function is useful in verifying the formal correctness of a pantun.

4.9 Summary

This chapter outlined the complete implementation of the digital Mukun Pantun archive system. From the setup of XAMPP, phpMyAdmin, and Visual Studio Code, to developing a functional, role-based portal, the project succeeded in establishing a reliable platform to collect, browse, and preserve Mukun pantun. The inclusion of user contributions, admin approvals, and categorized browsing ensures the system supports cultural sustainability while maintaining content quality.

Chapter 5: System Evaluation

5.1 Introduction

This chapter covers the evaluation of the developed system for the conservation of Sarawak Mukun Pantun. The purpose of this evaluation is to ensure that the system functions as intended

and fulfils the user requirements identified in earlier phases of the project. The evaluation process focuses on User Acceptance Testing (UAT) and System Usability Scale (SUS), which assesses the functionality, usability, and user satisfaction of the system. Through this evaluation, valuable feedback is obtained from actual users to determine whether the system is ready for deployment and practical use.

To facilitate this evaluation, a Google Form was created and distributed to participants. The form was structured into three main sections which are demographic information, the SUS questionnaire, and a feedback section. The SUS questionnaire utilized a standardized 10-item instrument to quantitatively measure the perceived usability of the system, using a 5-point Likert scale. The demographic section gathered background data such as age, gender, education level, and prior familiarity with Mukun pantun or digital archives. The feedback section collected respondent's insights and suggestions for further improvement.

5.2 User Acceptance Testing (UAT)

User Acceptance Testing (UAT) is the final phase of the software testing process, conducted to determine whether a system meets the functional, usability, and performance requirements established by end users (Leung & Wong, 1997). It involves real users interacting with the system in practical scenarios to validate that it performs as expected under realistic conditions. The primary goal of UAT is to ensure that the system is ready for deployment by verifying its reliability, user-friendliness, and alignment with business or project objectives (Leung & Wong, 1997). Any issues identified during this phase are addressed before the system is officially released. UAT serves as a critical quality assurance step to confirm that the solution delivers value and meets user expectations.

5.2.1 UAT Objectives

The objectives of UAT for this project includes:

1. Provides user-friendly interface for both general users and administrators.
2. Performs well in typical use scenarios with minimal errors or confusion.
3. Satisfies end-user expectations for usability and cultural relevance.
4. Ensure all core functions such as registration, login, browsing, searching, and uploading pantun work as intended.

5.2.2 UAT Test Cases

User Acceptance Testing (UAT) was conducted by 1 selected user and the author itself, performing the roles of both a general user and a designated administrator respectively. This internal assessment covered various system modules such as Browse, searching, uploading pantun, and user management (admin-only). For a detailed view of the System Usability Scale questionnaire employed in this study, please refer to Appendix B.

5.2.3 UAT Results

The UAT was conducted successfully involving both general users and an administrator. A total of sixteen test cases were developed and executed, covering all key modules of the system including registration, login, browsing, searching, uploading pantun, profile management, and administrative functionalities such as user management, pantun moderation, and settings.

Each test case was executed in accordance with predefined scenarios and conditions. The results indicated that all test cases passed with the expected outcomes being met. Minimal errors, crashes, or usability issues were encountered during the testing sessions.

Table 22.
Summary of UAT Results

Module Tested	Test Case ID	Status
User Registration	TC001	Pass
User Login	TC002	Pass
Browse Pantun	TC003	Pass
View Suggested Pantun Response	TC004	Pass
Upload Pantun	TC005	Pass
Search Pantun	TC006	Pass
User Profile Management	TC007	Pass
View User Contributions	TC008	Pass
User Logout	TC009	Pass
Admin Login	TC0010	Pass
Admin Pantun Management	TC0011	Pass
Admin User Management	TC0012	Pass
Admin Pantun Approval	TC0013	Pass

Manage Deleted Pantun	TC0014	Pass
Admin Password Change	TC0015	Pass
Admin Logout	TC0016	Pass

5.3 Demographic Information

The analysis of the responses from 21 participants who interacted with the system indicates a strong overall usability.

Demographic Section

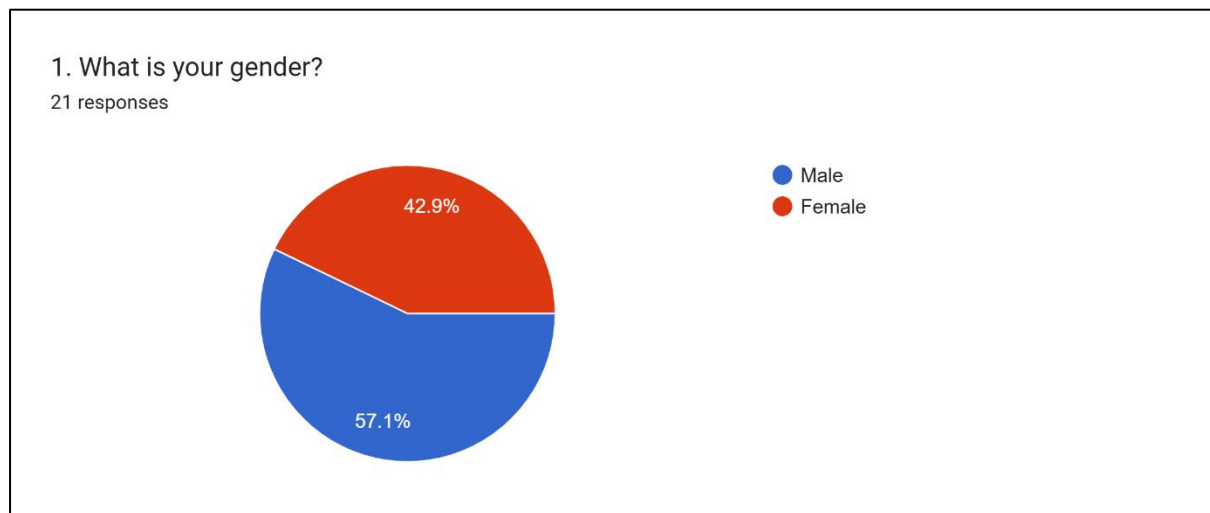


Figure 57. Gender Results

In Figure 57, for the demographic section, the majority of respondents were male, accounting for 57.14%, while females constituted 42.86%.

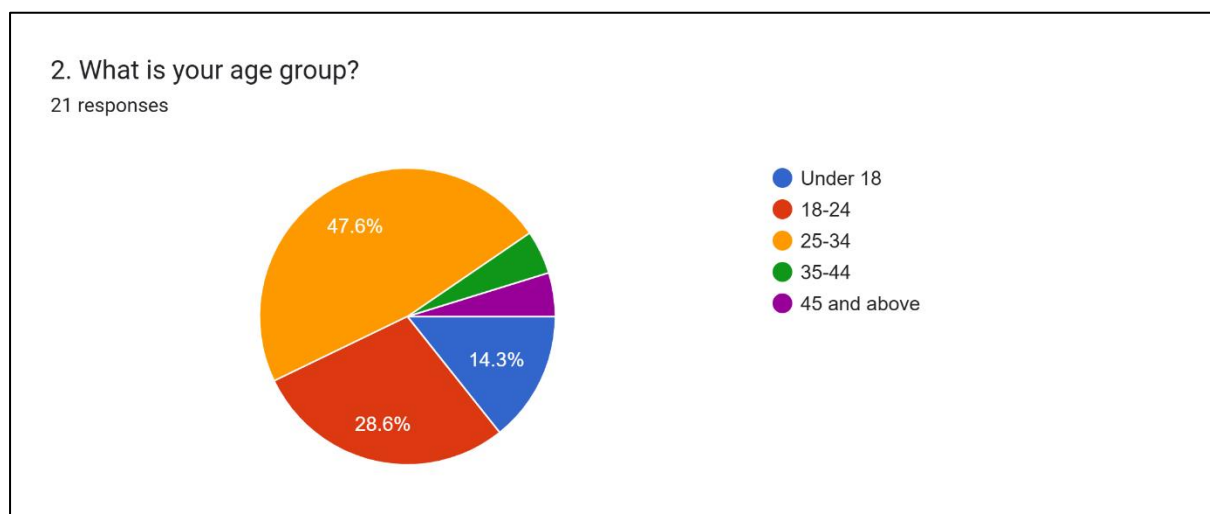


Figure 58. Age Group Results

In Figure 58, the predominant age group among the respondents was 25-34 years old, representing 47.62% of the participants. This was followed by the 18-24 age group at 28.57%, and a smaller proportion of participants under 18 years old (14.29%), 35-44 years old (4.76%), and 45 years and above (4.76%).

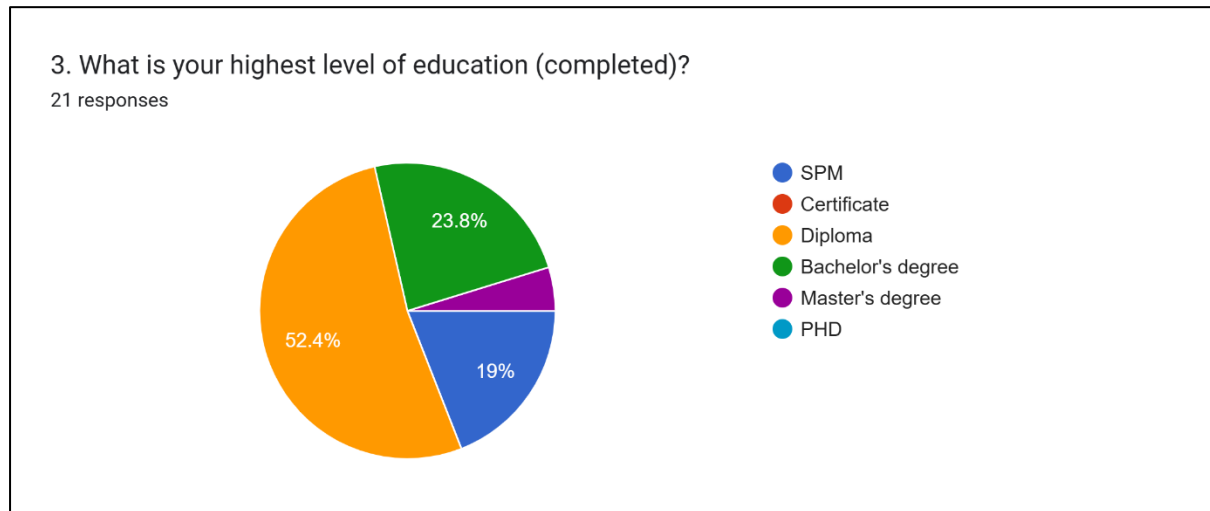


Figure 59. *Level of Education Results*

In Figure 59, in terms of educational background, 52.38% of the respondents held a Diploma, 23.81% possessed a Bachelor's degree, 19.05% had an SPM qualification, and 4.76% held a Master's degree.

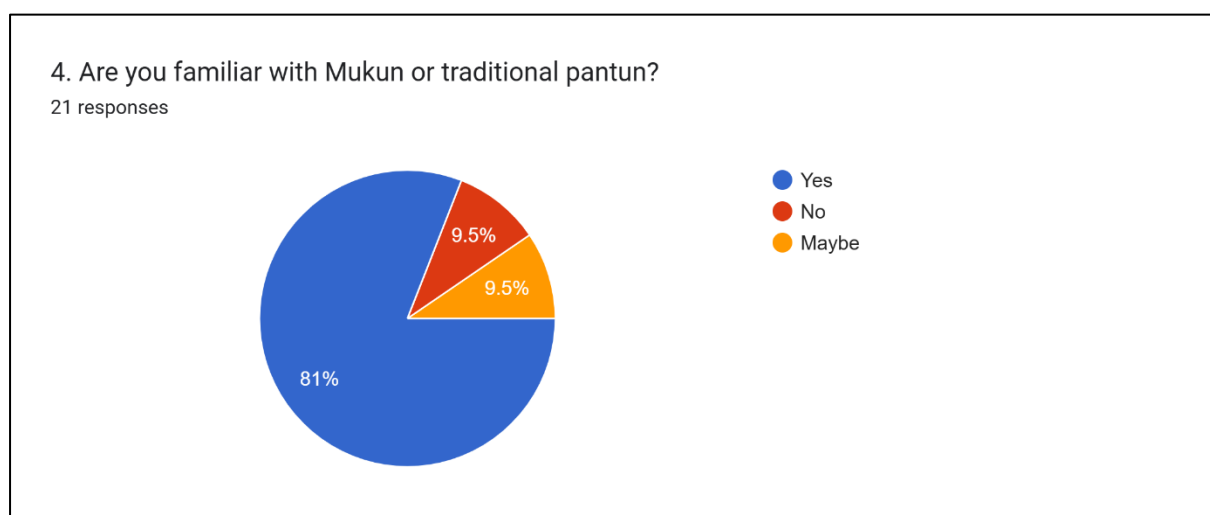


Figure 60. *Mukun Pantun Familiarity Results*

In Figure 60, regarding familiarity with Mukun or traditional pantun, 80.95% of participants reported being familiar, while 9.52% were unfamiliar, and another 9.52% were unsure.

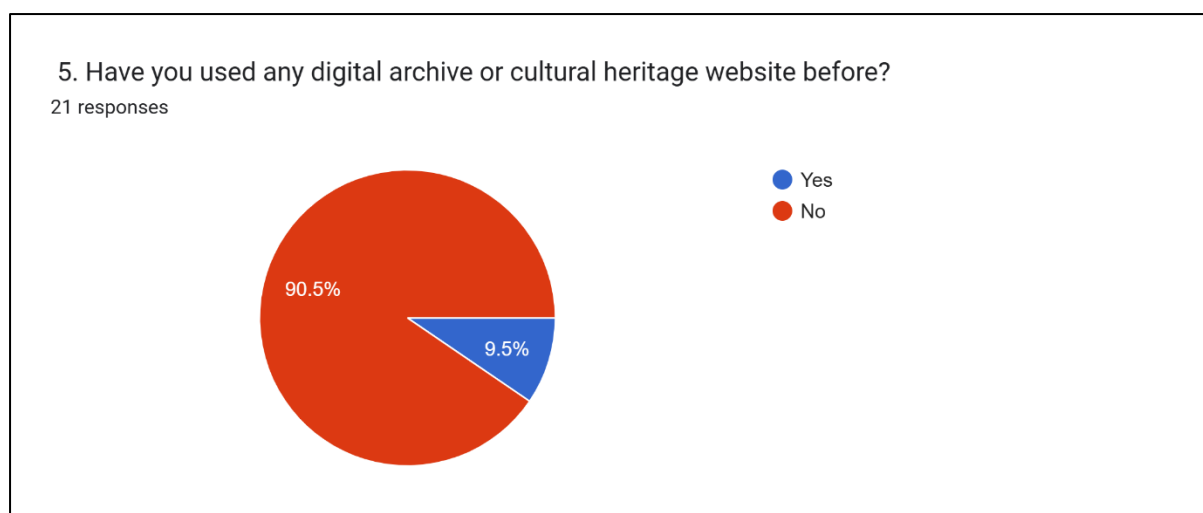


Figure 61. *Previous Experience with any digital archive websites*

In Figure 61, a significant majority, 90.48% of respondents, indicated they had no prior experience with digital archives or cultural heritage websites, with only 9.52% having such experience.

5.4 System Usability Scale (SUS)

The System Usability Scale (SUS), developed by John Brooke in 1986 at Digital Equipment Corporation, represents a widely adopted instrument for quantitatively assessing the perceived usability of diverse systems, encompassing websites, software applications, and hardware interfaces (Tullis & Albert, 2013). This psychometric tool comprises 10 distinct statements, each evaluated by participants on a 5-point Likert scale ranging from "strongly disagree" to "strongly agree." (Tullis & Albert, 2013). To mitigate potential response biases, the scale strategically alternates between positively and negatively worded items. Subsequent to data collection, participant responses are subjected to a standardized computational formula, yielding a composite score ranging from 0 to 100. This resultant score functions as a singular, comprehensive metric that encapsulates users' holistic perception of a system's overall usability (Tullis & Albert, 2013). For a detailed view of the System Usability Scale questionnaire employed in this study, please refer to Appendix C.

Respondent Answers

A Google Form was created based on the standardized questions for the System Usability Scale (SUS), as detailed in Appendix C. This section of the report presents the responses from 21

participants.

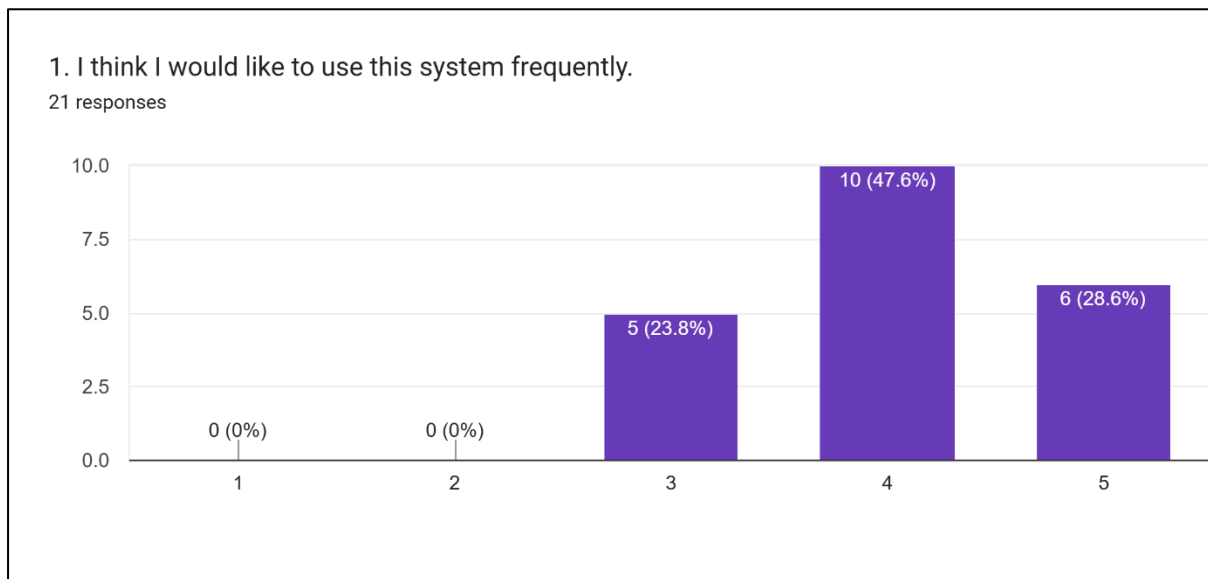


Figure 62. *SUS Question 1 Results*

In Figure 62, for the statement, "I think I would like to use this system frequently," 47.62% of respondents selected '4' and 28.57% selected '5', indicating a strong inclination towards frequent use.

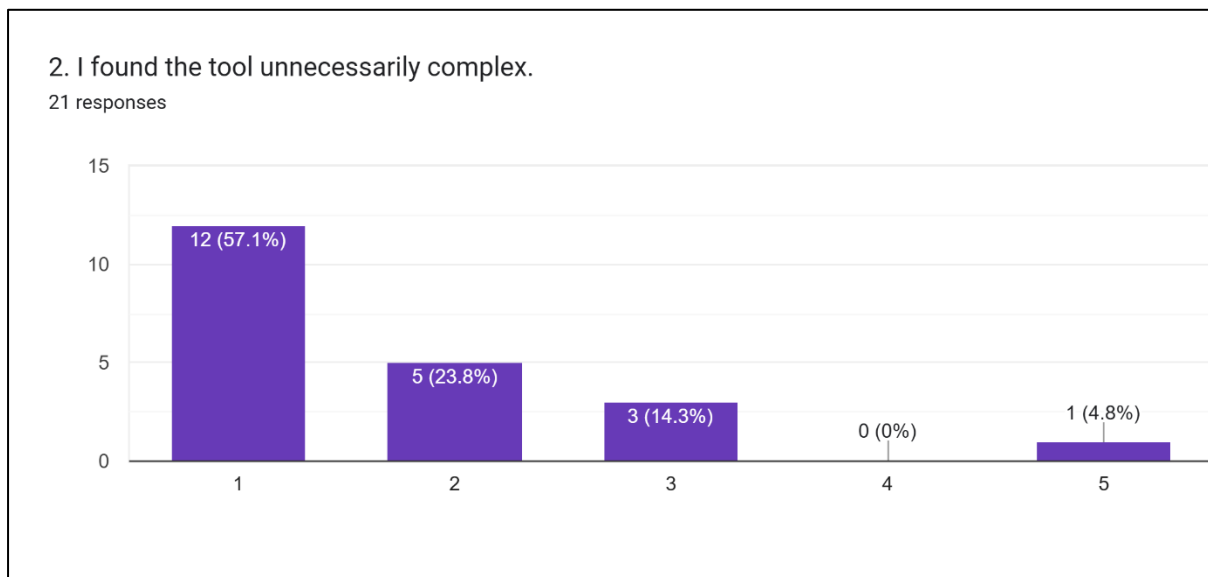


Figure 63. *SUS Question 2 Results*

In Figure 63, for the responses to "I found the tool unnecessarily complex," 57.14% of participants selected '1' (Strongly Disagree), and 23.81% selected '2', demonstrating that the system was generally not perceived as complex.

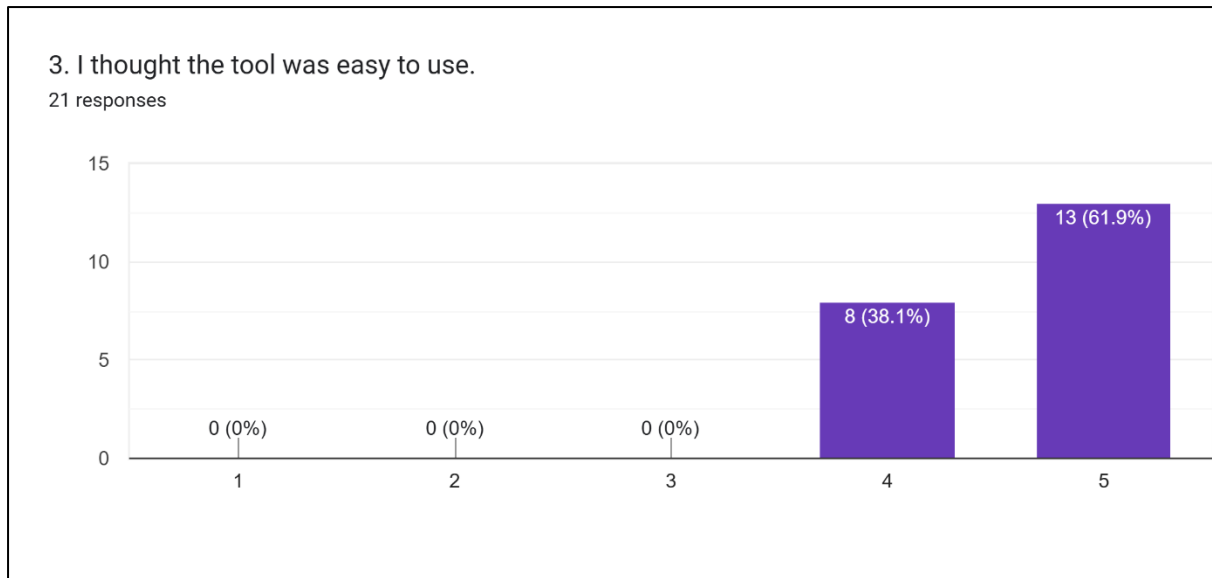


Figure 64. SUS Question 3 Results

In Figure 64, 61.90% of respondents selected '5' (Strongly Agree) and 38.10% selected '4' for the statement, "I thought the tool was easy to use," affirming the system's ease of use.

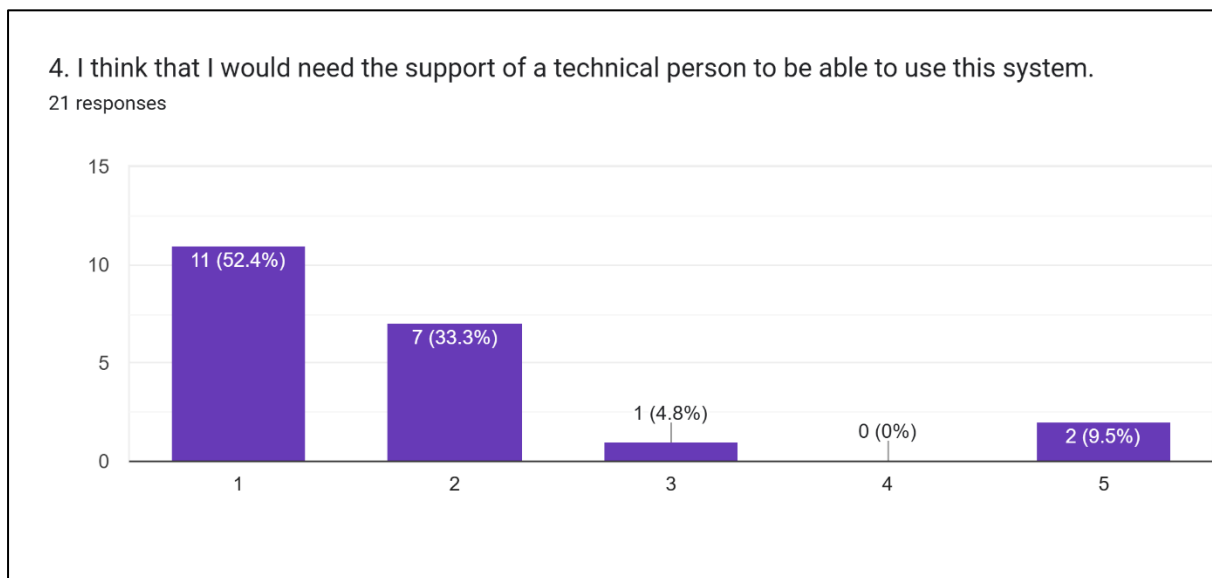


Figure 65. SUS Question 4 Results

In Figure 65, regarding the need for technical support, in response to "I think that I would need the support of a technical person to be able to use this system", 52.38% selected '1' (Strongly Disagree) and 33.33% selected '2', suggesting that the system does not require technical assistance for its operation.

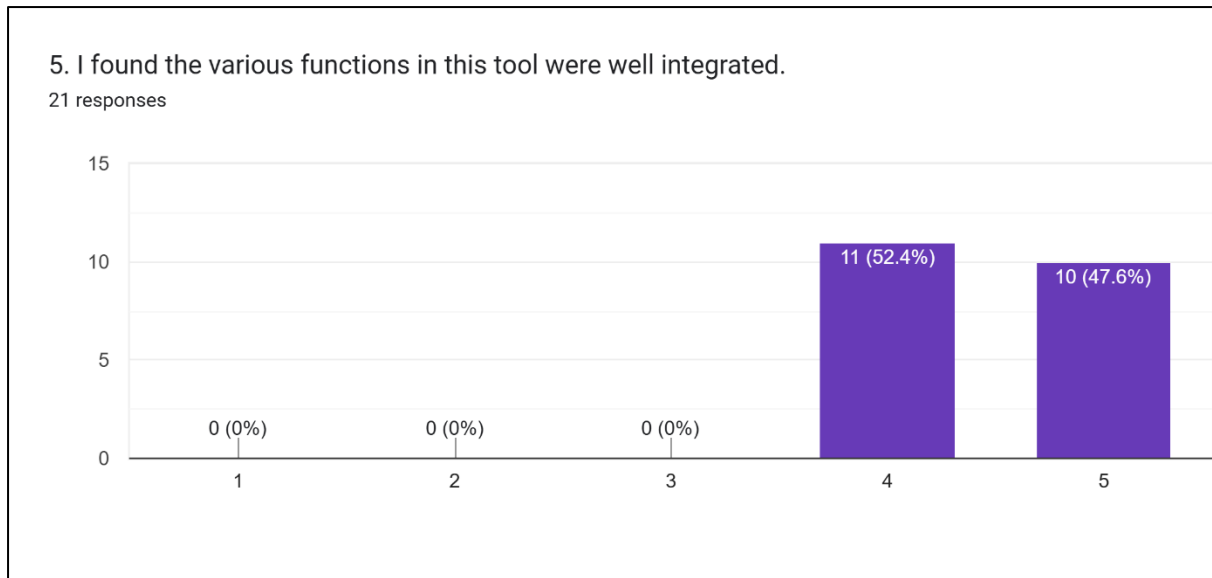


Figure 66. *SUS Question 5 Results*

In Figure 66, the statement, "I found the various functions in this tool were well integrated," garnered 47.62% of responses at '5' and 52.38% at '4', indicating high satisfaction with the integration of features.

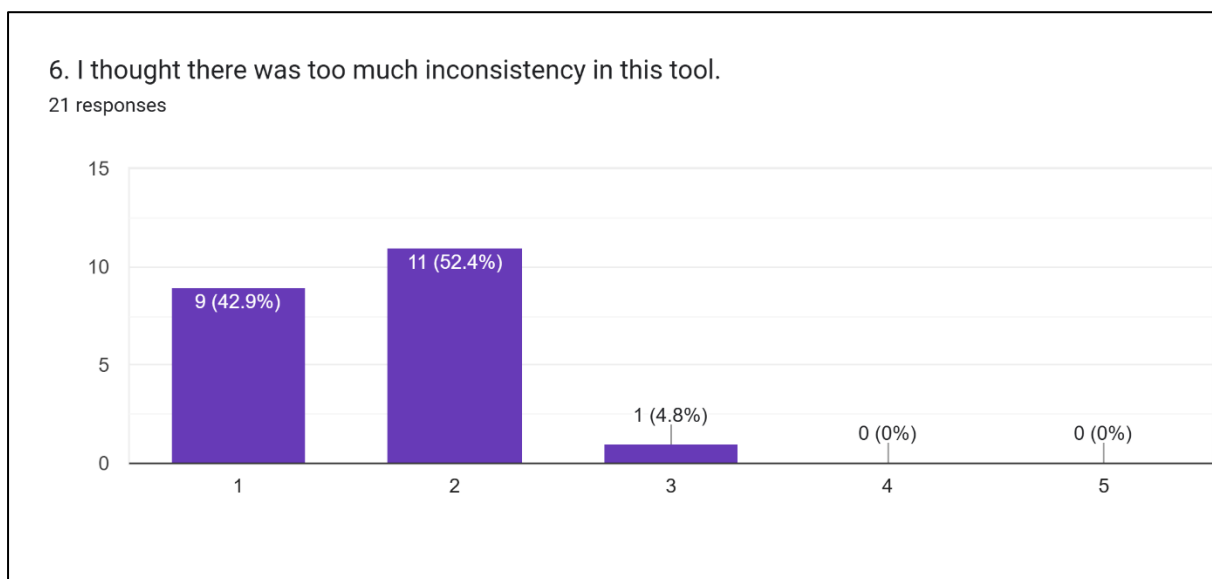


Figure 67. *SUS Question 6 Results*

In Figure 67, conversely, for "I thought there was too much inconsistency in this tool," 52.38% selected '2' and 42.86% selected '1' (Strongly Disagree), which suggests that the system-maintained consistency.

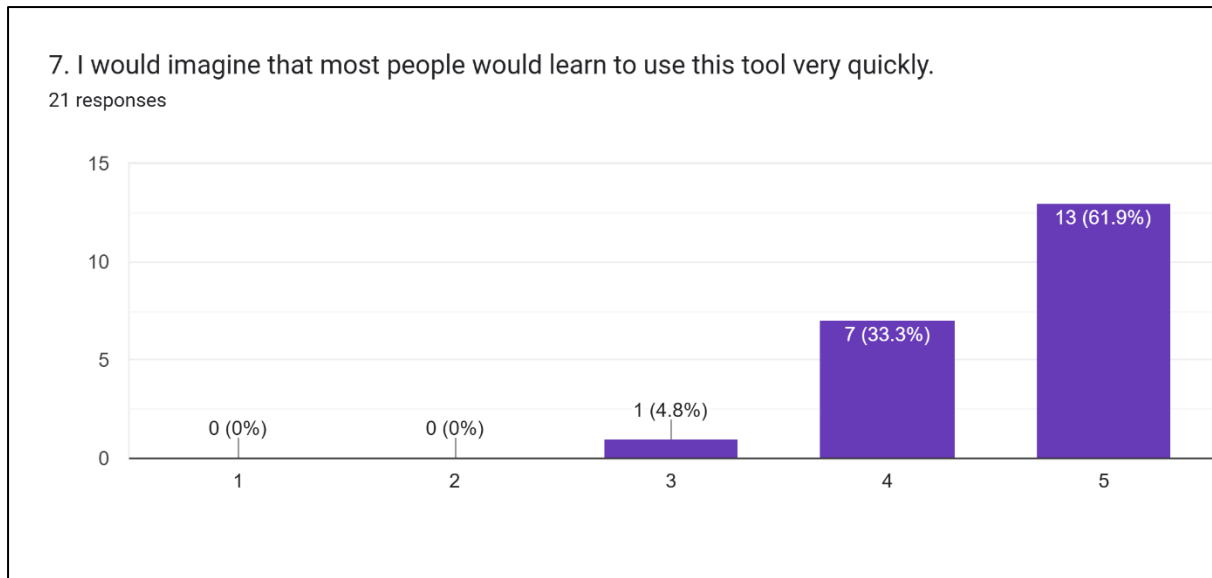


Figure 68. *SUS Question 7 Results*

In Figure 68, the perceived learning curve was low, as 61.90% of respondents selected '5' and 33.33% selected '4' for "I would imagine that most people would learn to use this tool very quickly."

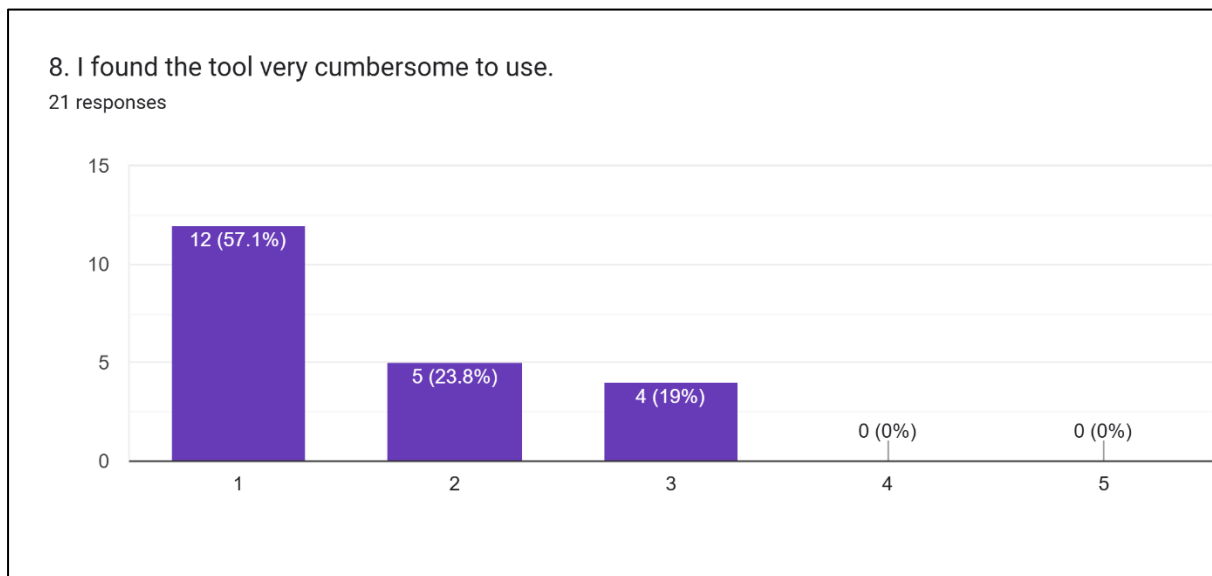


Figure 69. *SUS Question 8 Results*

In Figure 69, the system was not found cumbersome, with 57.14% of participants selecting '1' and 23.81% selecting '2' for the statement, "I found the tool very cumbersome to use."

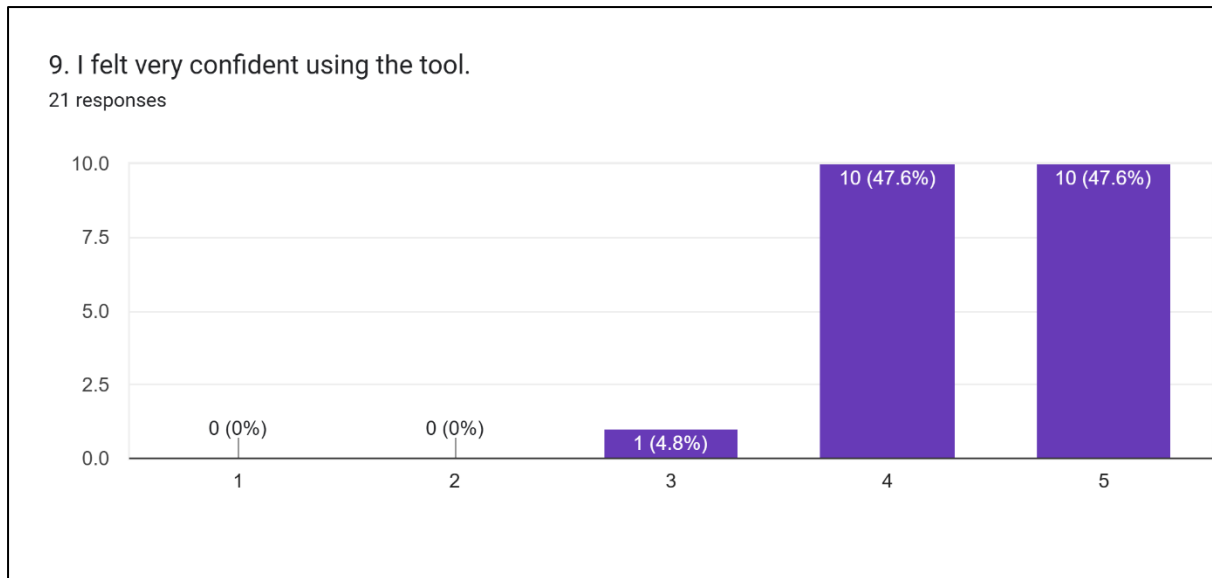


Figure 70. SUS Question 9 Results

In Figure 70, user confidence was high, with 47.62% selecting '5' and 47.62% selecting '4' for "I felt very confident using the tool."

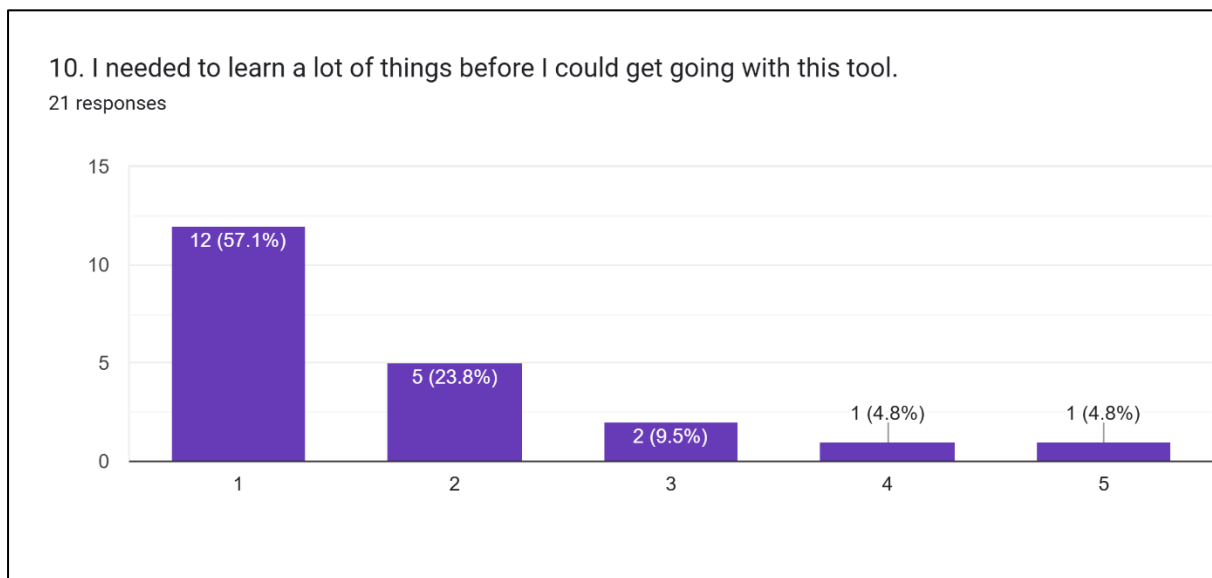


Figure 71. SUS Question 10 Results

Lastly, Figure 71, in response to "I needed to learn a lot of things before I could get going with this tool," 57.14% of respondents selected '1' (Strongly Disagree) and 23.81% selected '2', indicating minimal learning was required.

5.5 SUS Results

This section presents the results obtained from the System Usability Scale (SUS) questionnaire, which was used to evaluate the overall usability of the developed system. The responses were

collected from randomly selected 21 participants who interacted with the system. Participants rated various aspects of the system's usability on a 5-point Likert scale.

Table 23.
SUS Score for each participant

P/Q	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	SUS Score
P1	4	5	5	5	5	2	5	1	5	1	75
P2	5	1	5	3	5	2	3	3	4	3	75
P3	3	3	4	2	4	2	4	3	4	4	62.5
P4	3	3	4	5	4	3	5	3	4	5	52.5
P5	4	3	5	3	4	2	4	3	5	3	72.5
P6	4	1	5	1	5	1	5	1	5	1	97.5
P7	4	1	5	1	5	1	5	1	5	1	97.5
P8	3	2	4	2	4	2	4	2	4	2	72.5
P9	3	2	4	2	4	2	4	2	4	2	72.5
P10	4	2	4	2	4	2	5	1	4	1	82.5
P11	5	1	5	1	5	1	5	1	5	1	100
P12	5	1	5	1	5	1	5	1	5	1	100
P13	5	1	5	1	5	1	5	1	5	1	100
P14	4	2	4	2	4	2	4	2	4	2	75
P15	5	1	5	1	5	1	5	1	5	1	100
P16	5	1	5	1	4	2	4	1	3	2	85
P17	3	1	4	1	5	1	5	1	5	1	92.5
P18	4	1	5	1	4	1	5	2	4	1	90
P19	4	2	4	2	4	2	4	2	4	2	75
P20	4	1	5	1	4	2	5	1	4	1	90
P21	4	1	5	1	5	1	5	1	5	1	97.5
Total											1,765

$$\text{Overall SUS Score} = \frac{\sum_{i=1}^n \text{Individual SUS Score}_i}{n}$$

Where:

- $\sum \text{Individual SUS Score}_i$ is the sum of all individual SUS scores.
- n is the total number of participants.

To calculate the overall SUS score for this system:

$$\text{Overall SUS Score} = \frac{1,765}{21} \approx 84.047$$

Based on the calculation, the overall System Usability Scale (SUS) score for the system is determined to be 84.047. This score provides a quantitative measure of the system's perceived usability by its users. Referring to the established interpretation framework for SUS scores, as often cited in usability research (Bangor, Kortum, & Miller, 2000), a score of 84.047 falls into the "Excellent" category. This classification, typically associated with Grade A, indicates a highly favourable perception of usability. A score in this range suggests that users found the system intuitive, efficient, and satisfactory to interact with. It implies that the system effectively supports user tasks, requires minimal effort to learn, and generally leads to a positive user experience. This high SUS score reinforces the system's strong performance in terms of usability, highlighting its potential for widespread acceptance and effective user engagement.

5.6 Respondent's Feedback Section

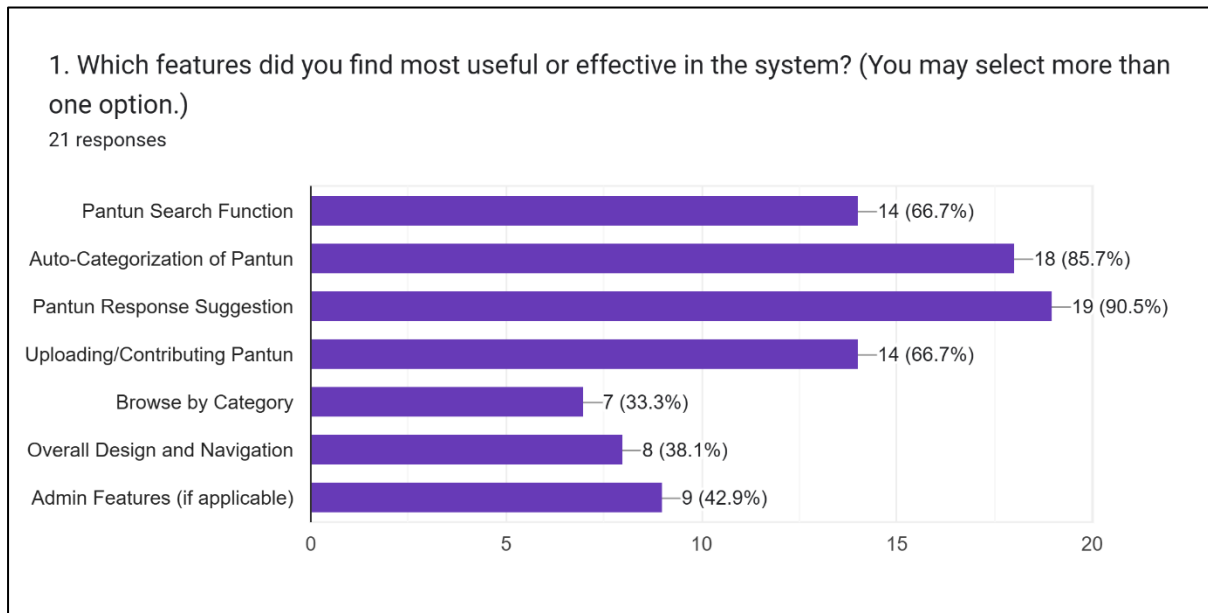


Figure 72. *Useful Features Results*

From Figure 72, the most highly rated feature was "Pantun Response Suggestion," selected by 90.5% of respondents (19 out of 21), indicating that users found the system's ability to provide

suitable pantun replies especially helpful. This was followed by "Auto-Categorization of Pantun," chosen by 85.7% of respondents. Both "Pantun Search Function" and "Uploading/Contributing Pantun" were selected by 66.7% of users, suggesting that the core interactive functions of the system were also highly valued. Meanwhile, "Admin Features" received a moderate approval, with 42.9% of respondents selecting it, possibly reflecting that only a subset of users engaged with admin-level tools. Other features such as "Overall Design and Navigation" and "Browse by Category" were selected by 38.1% and 33.3% of users respectively, indicating that while appreciated, these aspects were not considered as impactful as the system's main functional tools.

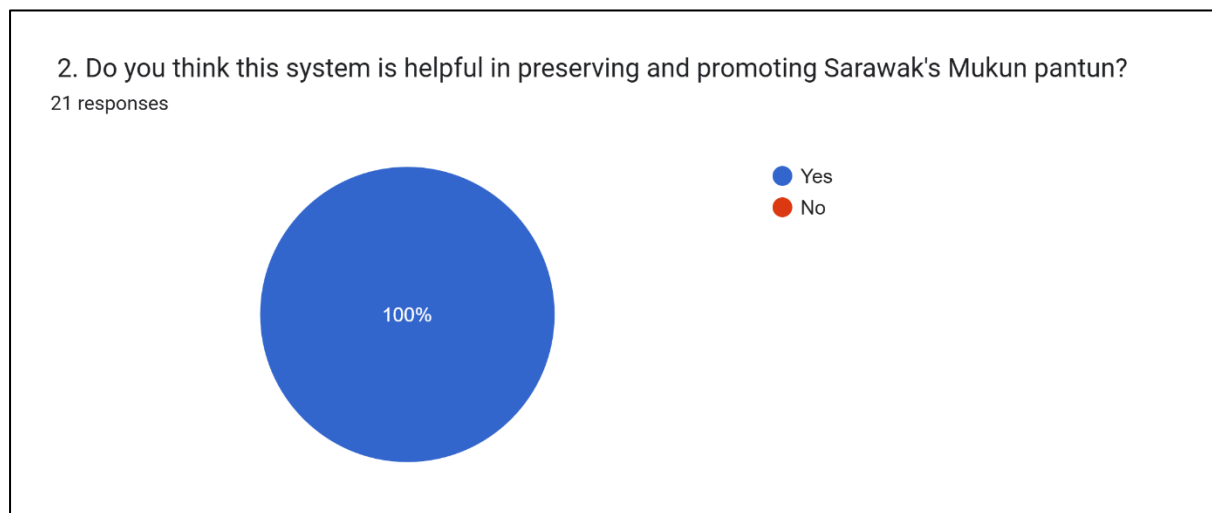


Figure 73. *System's Effectiveness Results*

In terms of the system's effectiveness in cultural preservation, 100% of participants believed the system was helpful in preserving and promoting Sarawak's Mukun pantun.

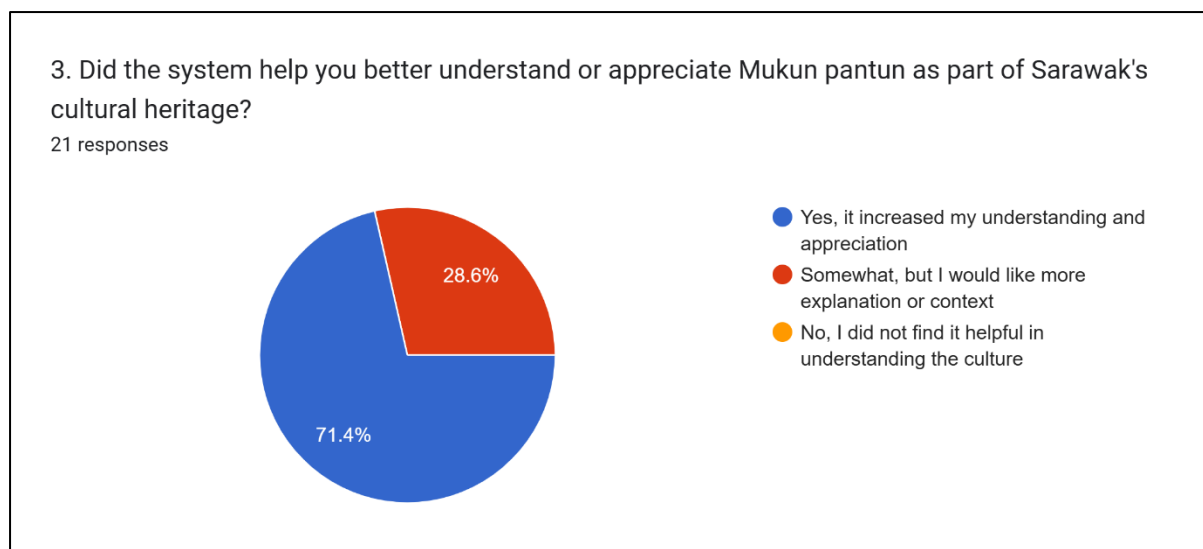


Figure 74. *Participant's Understanding of the system results*

In Figure 74, 71.43% of participants reported that the system increased their understanding and appreciation of Mukun pantun as part of Sarawak's cultural heritage, while 28.57% found it somewhat helpful but desired more explanation or context.

Open Ended Questions

For the open-ended question, "What improvements would you suggest to enhance the system's usability, content, or cultural value?", a majority of participants emphasized the importance of adding explanations or contextual meanings for each pantun. Phrases such as *"add explanation or meaning," "add meaning explanations,"* and *"add a feature to explain the cultural significance or moral of each pantun"* were repeatedly mentioned, indicating a strong user desire for deeper understanding of the poetic content.

Several respondents also suggested enhancing the audio component of the system, such as *"include audio recitations of the pantun for proper pronunciation and rhythm,"* which points to an opportunity to improve cultural engagement through sound.

Additionally, one participant proposed the use of interactive elements such as quizzes *"gunakan elemen permainan seperti kuiz untuk menarik minat pelajar muda"* to attract younger audiences, while another recommended expanding the collection based on specific themes *"banyakkan dan tambahkan lagi kokeksi pantun mengikut tema-tema"*.

For the question, "Would you recommend this system to others?", all 10 respondents answered positively, indicating a 100% recommendation rate. Common reasons included the system's usefulness for research, its role in preserving cultural heritage, and its ease of use. Several responses highlighted the system's value for students, cultural enthusiasts, and future generations, with remarks such as *"helpful for research," "encourages appreciation for local art,"* and *"easy to use and informative."*

5.7 Classification Algorithm Accuracy

To assess the accuracy of the classification algorithm used in this project, external verification was requested from Miss Najihah, the lecturer for PBM2072 Malay Language. Her expertise in the language made her a suitable candidate to evaluate whether the generated pantun responses were correctly classified. After a week of correspondence, Miss Najihah responded with a brief remark: *"Overall, the pantun were correctly classified into their respective categories."*

While this indicates general approval of the classification outcomes, the absence of detailed comments or individual assessments suggests that only a sample of the responses may have been reviewed. It is important to note that Miss Najihah has a tight schedule, and due to time limitations, this was the only feedback that could be obtained. Therefore, her response is interpreted as informal and not a thorough validation of all outputs. Due to these constraints, further refinement of the classification accuracy such as obtaining more comprehensive feedback or involving multiple reviewers was not feasible. This is acknowledged as a limitation of the current study.

Nonetheless, the positive response from Miss Najihah offers a level of confidence that the classification algorithm is functioning as intended within the defined scope and timeframe of the project.

5.8 Summary

This chapter has evaluated the developed Mukun Pantun Digital Archive System against the objectives outlined in Chapter 1, supported by insights from the literature review in Chapter 2, and aligned with the design and implementation described in Chapters 3 and 4. User Acceptance Testing (UAT) and System Usability Scale (SUS) assessments were conducted through a structured Google Form. The system achieved a high average SUS score of 84.05, indicating strong user satisfaction and usability. Demographic data confirmed participation

from a relevant user base, while feedback responses highlighted the effectiveness of key features such as pantun response suggestions and auto-categorization. Users also provided constructive feedbacks for improvement, particularly regarding cultural explanations and audio enhancements. Overall, the evaluation results demonstrate that the system is functional, user-friendly, and effective in supporting the conservation and accessibility of Sarawak's Mukun pantun, making it suitable for wider adoption and future enhancement.

Chapter 6: Conclusion and Future Works

6.1 Conclusion

This chapter finalizes the final year project by summarizing the overall accomplishments, identifying the project's limitations encountered during the system's development, and suggests directions for future improvements. This project, Harnessing Digital Archives for the Conservation of Sarawak Mukun Pantun, focused on creating a centralized, accessible platform to preserve and promote the traditional poetic art form of Mukun pantun. The work combined cultural preservation with digital innovation by integrating web technologies to support browsing, searching, uploading, and categorizing pantun. This concluding chapter reflects on the extent to which the objectives have been met and sets the stage for further development and sustainability of the digital archive.

The implementation of this project resulted in the successful fulfilment of all objectives outlined at the beginning of the research in chapter 1. Firstly, the system achieved the digitization and centralization of Mukun pantun, which were collected from various sources including printed materials, websites, and online platforms such as YouTube and Facebook.

Secondly, the web-based platform was developed using PHP and hosted locally via XAMPP, providing an interface through which users can interact with the archive. Users are able to register an account, upload pantuns, search pantun, and browse existing content according to thematic categories. The system incorporates both public access and role-based functions, offering different functions and permissions for users and administrators. This structure ensures both openness and moderation.

Thirdly, an auto-categorization feature was implemented to assist in organizing pantun by themes, improving the retrieval experience for users. The inclusion of a search feature further enables keyword-based discovery, making the archive more dynamic and user-driven. Finally, the system reflects an important step in ensuring the sustainability of the Mukun tradition, especially by engaging youth and the wider public with a culturally relevant and modern digital tool. Collectively, these achievements align well with the intended goals of conservation, accessibility, and user participation.

6.2 Project Limitations

Despite its successful development, several limitations were identified during the course of the project. One of the primary constraints involved the availability of authentic Mukun pantun. The data sources were often fragmented, and it required considerable effort to identify, verify, and compile examples that conformed to the correct structural and cultural norms of Mukun. This limited the size and diversity of the initial corpus included in the system.

Another limitation concerns the manual nature of the approval process. Although the system allows user submissions, all uploaded pantun must be reviewed and approved by an administrator to ensure quality control. This reliance on manual verification could pose scalability issues as the number of contributions increases. Similarly, the categorization mechanism, while functional, is relatively simple. It uses a rule-based approach based on keywords and themes, which may not capture the full linguistic richness or nuanced meanings found in traditional pantun.

Additionally, the current system focuses solely on text-based pantun, without incorporating audio or video elements. This omits the performative aspect of Mukun, which traditionally involves rhythm, melody, and vocal delivery. As such, users are unable to fully experience the cultural depth of Mukun performances.

6.3 Future Works

Building on the foundation established by this project, several enhancements can be considered in future iterations of the system. One promising area of development is the integration of audio and video files into the platform. Allowing users to upload recordings of Mukun performances would enrich the archive by preserving not only the textual content but also the intonational and musical characteristics of this oral art form.

The system's categorization feature could also be upgraded by incorporating natural language processing (NLP) techniques or machine learning algorithms to improve accuracy and contextual understanding. Such improvements would enable deeper semantic classification and potentially support features like intelligent pantun response generation.

Furthermore, an improved recommendation function could be introduced to help users find appropriate pantun replies, aligning the digital interaction with traditional pantun exchanges. To manage a growing volume of user submissions, future versions could also benefit from a community-based validation model, where users can vote, review, or comment

on contributed pantun. This would encourage collaborative curation and reduce administrative workload.

In addition, usability and accessibility testing should be conducted extensively, involving users of different age groups and technical backgrounds. This would provide valuable feedback for refining the user interface and enhancing the system's inclusivity.

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Appendix A

Website Links

1. Shikin Shapiee's Blog on Pantun Bermukun –
[<https://shikinshapiee.blogspot.com/2015/05/pantun-bermukun.html>]
2. Sarawak Pantun Blog –
[<https://pan-tun.blogspot.com/2011/09/pantun-sarawak-bergendang-bermukun.html>]
3. Pantun Sarawak Blogspot –
[<https://dporp.blogspot.com/2009/07/pantun-sarawak.html>]
4. Malaycivilization website –
[https://www.malaycivilization.com.my/omeka/items/browse?tags=Pantun+Melayu+Sarawak&sort_field=Dublin+Core%2CCreator&sort_dir=d&page=1]

YouTube Links

1. Bermukun Performace Example 1 –
[<https://youtu.be/qDxggGMYEAo?si=YsTV0WdkSz1gTjAA>]
2. Bermukun Performace Example 2 –
[https://youtu.be/xY-36r_tV9M?si=xWhdMCtvy3KLVWHO]
3. Bermukun Performace Example 3 –
[https://youtu.be/l5NDjnnD_0s?si=LfQVg18Z-gzeKKYh]
4. Bermukun Performace Example 4 –
[https://youtu.be/4bU_59CSHeM?si=gGfO8cIAdMVPfgfy]

TikTok Links

1. Bermukun Clip by isnaz691 –
[https://www.tiktok.com/@isnaz691/video/7435903171869805825?is_from_webapp=1&sender_device=pc&web_id=7460328667513554452]
2. Bermukun Clip by sindangfm –
[https://www.tiktok.com/@sindangfm/video/7423815555959885076?is_from_webapp=1&sender_device=pc&web_id=7460328667513554452]

3. Bermukun Clip by Awangko Karma –
[\[https://www.tiktok.com/@awgkokarmapgnjoll/video/7327663146397732104?is_from_webapp=1&sender_device=pc&web_id=7460328667513554452\]](https://www.tiktok.com/@awgkokarmapgnjoll/video/7327663146397732104?is_from_webapp=1&sender_device=pc&web_id=7460328667513554452)
4. Bermukun Clip by Dayang Azura675 –
[\[https://www.tiktok.com/@dayangazura0/video/7160425295806352667?is_from_webapp=1&sender_device=pc&web_id=7460328667513554452\]](https://www.tiktok.com/@dayangazura0/video/7160425295806352667?is_from_webapp=1&sender_device=pc&web_id=7460328667513554452)
5. Bermukun Clip by Donquixote_zubaxx –
[\[https://www.tiktok.com/@donquixote_zubaxx/video/7277117820620557570?is_from_webapp=1&sender_device=pc&web_id=7460328667513554452\]](https://www.tiktok.com/@donquixote_zubaxx/video/7277117820620557570?is_from_webapp=1&sender_device=pc&web_id=7460328667513554452)

Appendix B

TEST CASE PLANNING AND EXECUTION TEMPLATE

REGISTRATION TEST CASE

TEST TITLE	PRIORITY	TEST CASE ID	TEST NUMBER	TEST DATE
User Registration Functionality	High	TC001	1	16/5/2025

TEST DESCRIPTION	TEST DESIGNED BY	TEST EXECUTED BY	EXECUTION DATE
To verify that a user can successfully register with valid input and that proper validation is triggered for empty or invalid input.	Muhamad Audi Bin Pasha	Muhamad Audi Bin Pasha	16/5/2025

TEST DESCRIPTION	TEST DEPENDENCIES	TEST CONDITIONS	TEST CONTROL
To verify that a user can successfully register with valid input and that proper validation is triggered for empty or invalid input.	Registration page must be accessible; database must be connected.	No user account should already exist for the test email.	Use a new unique test email for every valid registration test

STEP ID	STEP DESCRIPTION	TEST DATE	EXPECTED RESULTS	ACTUAL RESULTS	PASS / FAIL	ADDITIONAL NOTES
A01	Fill in valid name, email, state, sub-state, age, and password.	16/5/2025	Registration form accepts input	As expected	Pass	
A02	Click Register	16/5/2025	Account is created and confirmation message appears	As expected	Pass	
A03	Leave all fields blank	16/5/2025	Validation messages shown, registration is not processed.	As expected	Pass	

USER LOGIN TEST CASE

TEST TITLE	PRIORITY	TEST CASE ID	TEST NUMBER	TEST DATE
User Login Validation	High	TC002	2	16/5/2025

TEST DESCRIPTION	TEST DESIGNED BY	TEST EXECUTED BY	EXECUTION DATE
To verify that login functionality works correctly for valid and invalid credentials.	Muhamad Audi Bin Pasha	Muhamad Audi Bin Pasha	16/5/2025

TEST DESCRIPTION	TEST DEPENDENCIES	TEST CONDITIONS	TEST CONTROL
To verify that login functionality works correctly for valid and invalid credentials.	At least one user must already exist in the database.	Registered credentials must be known for the test.	Use a known test account created in the registration test.

STEP ID	STEP DESCRIPTION	TEST DATE	EXPECTED RESULTS	ACTUAL RESULTS	PASS / FAIL	ADDITIONAL NOTES
B01	Enter valid email and password	16/5/2025	User logs in successfully and is redirected to the main page.	As expected	Pass	
B02	Enter valid email and wrong password	16/5/2025	Error message shown: "Invalid Credentials" and user unable to log in.	As expected	Pass	
B03	Enter invalid email and password	16/5/2025	Error message shown: "User not found"	As expected	Pass	

BROWSE PANTUN TEST CASE

TEST TITLE	PRIORITY	TEST CASE ID	TEST NUMBER	TEST DATE
Browse Pantun Interface	Medium	TC003	3	16/5/2025

TEST DESCRIPTION	TEST DESIGNED BY	TEST EXECUTED BY	EXECUTION DATE
To verify that users can browse all pantun entries and also filter by category.	Muhamad Audi Bin Pasha	Muhamad Audi Bin Pasha	16/5/2025

TEST DESCRIPTION	TEST DEPENDENCIES	TEST CONDITIONS	TEST CONTROL
To verify that users can browse all pantun entries and also filter by category.	Pantun must be pre-uploaded and categorized in the system.	System should contain at least one pantun for each category.	Use test data inserted before test run.

STEP ID	STEP DESCRIPTION	TEST DATE	EXPECTED RESULTS	ACTUAL RESULTS	PASS / FAIL	ADDITIONAL NOTES
C01	Open "Browse Pantun" page	16/5/2025	The page loads all pantuns with pagination.	As expected	Pass	
C02	Navigate between pages	16/5/2025	Pantun lists load page-by-page.	As expected	Pass	
C03	Select a category from the dropdown box.	16/5/2025	Only pantun from selected category appears.	As expected	Pass	

PANTUN RESPONSE TEST CASE

TEST TITLE	PRIORITY	TEST CASE ID	TEST NUMBER	TEST DATE
Suggested Pantun Response Viewer	Medium	TC004	4	16/5/2025

TEST DESCRIPTION	TEST DESIGNED BY	TEST EXECUTED BY	EXECUTION DATE
To verify that clicking on a pantun displays its corresponding response suggestions.	Muhamad Audi Bin Pasha	Muhamad Audi Bin Pasha	16/5/2025

TEST DESCRIPTION	TEST DEPENDENCIES	TEST CONDITIONS	TEST CONTROL
To verify that clicking on a pantun displays its corresponding response suggestions.	System must contain pantun pairs or suggested responses.	At least one pantun must have a matching score.	Each pantun must have a matching score.

STEP ID	STEP DESCRIPTION	TEST DATE	EXPECTED RESULTS	ACTUAL RESULTS	PASS / FAIL	ADDITIONAL NOTES
D01	Click on a pantun from the list.	16/5/2025	Pantun detail page opens.	As expected	Pass	
D02	View suggested response	16/5/2025	System shows 1 or more suggested responses linked to the pantun.	As expected	Pass	

UPLOAD PANTUN TEST CASE

TEST TITLE	PRIORITY	TEST CASE ID	TEST NUMBER	TEST DATE
Pantun Upload Functionality	High	TC005	5	16/5/2025

TEST DESCRIPTION	TEST DESIGNED BY	TEST EXECUTED BY	EXECUTION DATE
To verify that both public and registered users can upload pantun in valid formats and that validation works when fields are incomplete.	Muhamad Audi Bin Pasha	Muhamad Audi Bin Pasha	16/5/2025

TEST DESCRIPTION	TEST DEPENDENCIES	TEST CONDITIONS	TEST CONTROL
To verify that both public and registered users can upload pantun in valid formats and that validation works when fields are incomplete.	Upload feature must be accessible and connected to the database.	System should distinguish between public and registered users.	Upload test with known users and sample data.

STEP ID	STEP DESCRIPTION	TEST DATE	EXPECTED RESULTS	ACTUAL RESULTS	PASS / FAIL	ADDITIONAL NOTES
E01	Public user enters 4 pantun lines in any format	16/5/2025	Error message shown: "Please login first to upload pantun"	As expected	Pass	
E02	Registered user enters 4 pantun lines in any format	16/5/2025	Error message shown: "Pantun must follow in A-A-A-A or A-B-A-B rhyme scheme"	As expected	Pass	
E03	Upload pantun in A-A-A-A or A-B-A-B format	16/5/2025	Pantun uploaded & waiting for admin approval	As expected	Pass	
E04	Upload pantun with fewer than 4 lines	16/5/2025	Error message shown: "Please fill in all pantun lines"	As expected	Pass	
E05	Fill all 4 lines and click 'Clear' button	16/5/2025	All fields are reset	As expected	Pass	

SEARCH PANTUN TEST CASE

TEST TITLE	PRIORITY	TEST CASE ID	TEST NUMBER	TEST DATE
Pantun Search Functionality	High	TC006	6	16/5/2025

TEST DESCRIPTION	TEST DESIGNED BY	TEST EXECUTED BY	EXECUTION DATE
To verify that users can search for pantun using any keyword from any line, and can view pantun suggestions and clear the search input.	Muhamad Audi Bin Pasha	Muhamad Audi Bin Pasha	16/5/2025

TEST DESCRIPTION	TEST DEPENDENCIES	TEST CONDITIONS	TEST CONTROL
To verify that users can search for pantun using any keyword from any line, and can view pantun suggestions and clear the search input.	Search algorithm must be functional.	There must be pantun that match the search keyword/	Use known pantun lines with test keywords.

STEP ID	STEP DESCRIPTION	TEST DATE	EXPECTED RESULTS	ACTUAL RESULTS	PASS / FAIL	ADDITIONAL NOTES
F01	Enter keyword in any line field.	16/5/2025	Keyword accepted.	As expected	Pass	
F02	Click 'Search' button.	16/5/2025	List of matching pantuns shown.	As expected	Pass	
F03	Click on pantun from results.	16/5/2025	Suggested response is displayed.	As expected	Pass	
F04	Click 'Clear' button.	16/5/2025	All fields are emptied.	As expected	Pass	

USER PROFILE TEST CASE

TEST TITLE	PRIORITY	TEST CASE ID	TEST NUMBER	TEST DATE
User Profile Update Functionality	Medium	TC007	7	16/5/2025

TEST DESCRIPTION	TEST DESIGNED BY	TEST EXECUTED BY	EXECUTION DATE
To verify that a logged-in user can update their profile details including personal information and password.	Muhamad Audi Bin Pasha	Muhamad Audi Bin Pasha	16/5/2025

TEST DESCRIPTION	TEST DEPENDENCIES	TEST CONDITIONS	TEST CONTROL
To verify that a logged-in user can update their profile details including personal information and password.	User must be logged in.	Fields must accept valid input formats.	Use a test user account with editable details.

STEP ID	STEP DESCRIPTION	TEST DATE	EXPECTED RESULTS	ACTUAL RESULTS	PASS / FAIL	ADDITIONAL NOTES
G01	Edit name, email, state, sub-state, age.	16/5/2025	Fields accept changes.	As expected	Pass	
G02	Edit password field with new value.	16/5/2025	Password input accepted securely.	As expected	Pass	
G03	Click "Update Profile".	16/5/2025	Profile saved and success message shown.	As expected	Pass	

USER CONTRIBUTION TEST CASE

TEST TITLE	PRIORITY	TEST CASE ID	TEST NUMBER	TEST DATE
View User-Contributed Pantun	Medium	TC008	8	16/5/2025

TEST DESCRIPTION	TEST DESIGNED BY	TEST EXECUTED BY	EXECUTION DATE
To verify that users can view pantun they have contributed and are prompted to contribute if none exist.	Muhamad Audi Bin Pasha	Muhamad Audi Bin Pasha	16/5/2025

TEST DESCRIPTION	TEST DEPENDENCIES	TEST CONDITIONS	TEST CONTROL
To verify that users can view pantun they have contributed and are prompted to contribute if none exist.	User must be logged in.	System must be able to identify the current user's contributions.	Use both a user with existing pantun and one with no contributions.

STEP ID	STEP DESCRIPTION	TEST DATE	EXPECTED RESULTS	ACTUAL RESULTS	PASS / FAIL	ADDITIONAL NOTES
H01	User opens "My Contributions" page.	16/5/2025	Pantun contributed by the user are listed.	As expected	Pass	
H02	If no pantun exists.	16/5/2025	"Contribute Pantun" button appears.	As expected	Pass	
H03	Click "Contribute Pantun" button.	16/5/2025	Redirect users to upload pantun page.	As expected	Pass	

USER LOGOUT TEST CASE

TEST TITLE	PRIORITY	TEST CASE ID	TEST NUMBER	TEST DATE
User logout	High	TC009	9	16/5/2025

TEST DESCRIPTION	TEST DESIGNED BY	TEST EXECUTED BY	EXECUTION DATE
To verify that users can log out and that their session ends correctly.	Muhamad Audi Bin Pasha	Muhamad Audi Bin Pasha	16/5/2025

TEST DESCRIPTION	TEST DEPENDENCIES	TEST CONDITIONS	TEST CONTROL
To verify that users can log out and that their session ends correctly.	User must be logged in.	Browser session must be valid.	Use a logged-in user.

STEP ID	STEP DESCRIPTION	TEST DATE	EXPECTED RESULTS	ACTUAL RESULTS	PASS / FAIL	ADDITIONAL NOTES
I01	Click Logout button.	16/5/2025	User session ends.	As expected	Pass	
I02	User is redirected to login page.	16/5/2025	Login page loads.	As expected	Pass	

ADMIN LOGIN TEST CASE

TEST TITLE	PRIORITY	TEST CASE ID	TEST NUMBER	TEST DATE
Admin Login Validation	High	TC010	10	17/5/2025

TEST DESCRIPTION	TEST DESIGNED BY	TEST EXECUTED BY	EXECUTION DATE
To verify that an admin can log in with valid credentials and receives proper errors for invalid input.	Muhamad Audi Bin Pasha	Muhamad Audi Bin Pasha	17/5/2025

TEST DESCRIPTION	TEST DEPENDENCIES	TEST CONDITIONS	TEST CONTROL
To verify that an admin can log in with valid credentials and receives proper errors for invalid input.	Admin account must exist in database.	Use correct and incorrect admin credentials.	Use known test credentials.

STEP ID	STEP DESCRIPTION	TEST DATE	EXPECTED RESULTS	ACTUAL RESULTS	PASS / FAIL	ADDITIONAL NOTES
J01	Enter valid admin username and password	17/5/2025	Login successful, dashboard opens	As expected	Pass	
J02	Enter valid username but wrong password	17/5/2025	Error: Invalid credentials	As expected	Pass	
J03	Enter invalid username and wrong password	17/5/2025	Error: User not found	As expected	Pass	

MANAGE PANTUN – ADMIN TEST CASE

TEST TITLE	PRIORITY	TEST CASE ID	TEST NUMBER	TEST DATE
Pantun Management by Admin	High	T011	11	17/5/2025

TEST DESCRIPTION	TEST DESIGNED BY	TEST EXECUTED BY	EXECUTION DATE
To verify that the admin can manage pantun: search, edit, delete, view details, and paginate through entries.	Muhamad Audi Bin Pasha	Muhamad Audi Bin Pasha	17/5/2025

TEST DESCRIPTION	TEST DEPENDENCIES	TEST CONDITIONS	TEST CONTROL
To verify that the admin can manage pantun: search, edit, delete, view details, and paginate through entries.	Admin must be logged in. Pantun must exist in system.	Admin dashboard features must be active.	Use a variety of pantun in different categories.

STEP ID	STEP DESCRIPTION	TEST DATE	EXPECTED RESULTS	ACTUAL RESULTS	PASS / FAIL	ADDITIONAL NOTES
K01	Search pantun by keyword.	17/5/2025	Matching pantun shown.	As expected	Pass	
K02	Filter pantun by category.	17/5/2025	Filtered pantun shown.	As expected	Pass	
K03	Edit lines and category, click update.	17/5/2025	Changes saved and confirmed.	As expected	Pass	
K04	Click delete.	17/5/2025	Pantun moved to deleted pantun page.	As expected	Pass	
K05	View uploaded pantun with contributor details.	17/5/2025	Contributor and category displayed.	As expected	Pass	
K06	Paginate pantun list.	17/5/2025	Pantun appear page-by-page.	As expected	Pass	

MANAGE USERS – ADMIN TEST CASE

TEST TITLE	PRIORITY	TEST CASE ID	TEST NUMBER	TEST DATE
User Management by Admin	High	T012	12	17/5/2025

TEST DESCRIPTION	TEST DESIGNED BY	TEST EXECUTED BY	EXECUTION DATE
To verify that the admin can search, view, edit, deactivate/reactivate, and approve or reject user pantun from profile.	Muhamad Audi Bin Pasha	Muhamad Audi Bin Pasha	17/5/2025

TEST DESCRIPTION	TEST DEPENDENCIES	TEST CONDITIONS	TEST CONTROL
To verify that the admin can search, view, edit, deactivate/reactivate, and approve or reject user pantun from profile.	Admin dashboard must be accessible.	Multiple user accounts should exist.	Include active, inactive, and pending user entries.

STEP ID	STEP DESCRIPTION	TEST DATE	EXPECTED RESULTS	ACTUAL RESULTS	PASS / FAIL	ADDITIONAL NOTES
L01	Search users by keywords.	17/5/2025	Matching users appear.	As expected	Pass	
L02	Edit user details and click update.	17/5/2025	Changes saved.	As expected	Pass	
L03	View user details and pantun contributions.	17/5/2025	Info displayed correctly.	As expected	Pass	
L04	Approve/reject pending pantun in profile.	17/5/2025	Status updated accordingly.	As expected	Pass	
L05	Deactivate/reactivate user account.	17/5/2025	Account status changes.	As expected	Pass	

PANTUN APPROVAL – ADMIN TEST CASE

TEST TITLE	PRIORITY	TEST CASE ID	TEST NUMBER	TEST DATE
Admin Pantun Approval Panel	High	TC013	13	17/5/2025

TEST DESCRIPTION	TEST DESIGNED BY	TEST EXECUTED BY	EXECUTION DATE
To verify that admins can approve or reject pending pantun submissions with full information shown.	Muhamad Audi Bin Pasha	Muhamad Audi Bin Pasha	17/5/2025

TEST DESCRIPTION	TEST DEPENDENCIES	TEST CONDITIONS	TEST CONTROL
To verify that admins can approve or reject pending pantun submissions with full information shown.	Pantun must be in pending state.	At least one unapproved pantun in system.	Use test data marked as pending.

STEP ID	STEP DESCRIPTION	TEST DATE	EXPECTED RESULTS	ACTUAL RESULTS	PASS / FAIL	ADDITIONAL NOTES
M01	Open pantun approval panel.	17/5/2025	Pending pantun shown in cards.	As expected	Pass	
M02	View pantun details.	17/5/2025	Contributor, category, and date shown.	As expected	Pass	
M03	Click approve or reject.	17/5/2025	Pantun status updated.	As expected	Pass	

MANAGE DELETED PANTUN – ADMIN TEST CASE

TEST TITLE	PRIORITY	TEST CASE ID	TEST NUMBER	TEST DATE
Deleted Pantun Management	Medium	TC014	14	17/5/2025

TEST DESCRIPTION	TEST DESIGNED BY	TEST EXECUTED BY	EXECUTION DATE
To verify that admins can manage deleted pantun by restoring or permanently removing them.	Muhamad Audi Bin Pasha	Muhamad Audi Bin Pasha	17/5/2025

TEST DESCRIPTION	TEST DEPENDENCIES	TEST CONDITIONS	TEST CONTROL
To verify that admins can manage deleted pantun by restoring or permanently removing them.	Pantun must exist in deleted list.	Deleted pantun must be properly tracked.	Use pantun previously deleted by admin.

STEP ID	STEP DESCRIPTION	TEST DATE	EXPECTED RESULTS	ACTUAL RESULTS	PASS / FAIL	ADDITIONAL NOTES
N01	Open deleted pantun page.	17/5/2025	List of deleted pantuns shown.	As expected	Pass	
N02	Click "Restore".	17/5/2025	Pantun moved back to main list.	As expected	Pass	
N03	Click "Permanently Delete".	17/5/2025	Pantun removed permanently.	As expected	Pass	

SETTINGS – ADMIN TEST CASE

TEST TITLE	PRIORITY	TEST CASE ID	TEST NUMBER	TEST DATE
Admin Password Change	Medium	TC015	15	17/5/2025

TEST DESCRIPTION	TEST DESIGNED BY	TEST EXECUTED BY	EXECUTION DATE
To verify that admins can change their password via settings page.	Muhamad Audi Bin Pasha	Muhamad Audi Bin Pasha	17/5/2025

TEST DESCRIPTION	TEST DEPENDENCIES	TEST CONDITIONS	TEST CONTROL
To verify that admins can change their password via settings page.	Admin must be logged in.	Current password must be known.	Use real admin account and reset to known password after test.

STEP ID	STEP DESCRIPTION	TEST DATE	EXPECTED RESULTS	ACTUAL RESULTS	PASS / FAIL	ADDITIONAL NOTES
P01	Enter current password.	17/5/2025	Field accepts valid input.	As expected	Pass	
P02	Enter incorrect current password.	17/5/2025	Error message shown: "Current password is incorrect".	As expected	Pass	
P03	Enter and correctly retype new password.	17/5/2025	Both new passwords match.	As expected	Pass	
P04	Enter and incorrectly retype new password.	17/5/2025	Error message shown: "New Password don't match".	As expected	Pass	
P05	Click "Change Password".	17/5/2025	Confirmation message shown.	As expected	Pass	

LOGOUT– ADMIN TEST CASE

TEST TITLE	PRIORITY	TEST CASE ID	TEST NUMBER	TEST DATE
Admin Logout	High	TC016	16	17/5/2025

TEST DESCRIPTION	TEST DESIGNED BY	TEST EXECUTED BY	EXECUTION DATE
To verify that admins can log out with confirmation and that session ends correctly.	Muhamad Audi Bin Pasha	Muhamad Audi Bin Pasha	17/5/2025

TEST DESCRIPTION	TEST DEPENDENCIES	TEST CONDITIONS	TEST CONTROL
To verify that admins can log out with confirmation and that session ends correctly.	Admin must be logged in.	Logout button must be functional.	Confirm logout via popup during test.

STEP ID	STEP DESCRIPTION	TEST DATE	EXPECTED RESULTS	ACTUAL RESULTS	PASS / FAIL	ADDITIONAL NOTES
Q01	Click Logout from sidebar.	17/5/2025	Logout confirmation popup appears.	As expected	Pass	
Q02	Click "No".	17/5/2025	Logout cancelled.	As expected	Pass	
Q03	Click "Yes".	17/5/2025	Admin logged out, redirected to admin login page.	As expected	Pass	

Appendix C

Please enter your participant number: _____

System Usability Scale (SUS)

This is a standard questionnaire that measures the overall usability of a system. Please select the answer that best expresses how you feel about each statement after using the website today.

	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1. I think I would like to use this tool frequently.	☐	☐	☐	☐	☐
2. I found the tool unnecessarily complex.	☐	☐	☐	☐	☐
3. I thought the tool was easy to use.	☐	☐	☐	☐	☐
4. I think that I would need the support of a technical person to be able to use this system.	☐	☐	☐	☐	☐
5. I found the various functions in this tool were well integrated.	☐	☐	☐	☐	☐
6. I thought there was too much inconsistency in this tool.	☐	☐	☐	☐	☐
7. I would imagine that most people would learn to use this tool very quickly.	☐	☐	☐	☐	☐
8. I found the tool very cumbersome to use.	☐	☐	☐	☐	☐
9. I felt very confident using the tool.	☐	☐	☐	☐	☐
10. I needed to learn a lot of things before I could get going with this tool.	☐	☐	☐	☐	☐

How likely are you to recommend this website to others? (please circle your answer)

Not at all likely 0 1 2 3 4 5 6 7 8 9 10
Extremely likely