



## **Development of a Web-Based Digital Dictionary for the Most Common Vocabulary in the Qur'an**

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**Abstract**– Access to learning the most common Quranic vocabulary remains a challenge, particularly for the Deaf and Hard of Hearing community who face a significant lack of inclusive digital resources. Existing digital dictionaries often overlook this demographic, failing to provide crucial accessibility features such as sign language video translations. This research aims to bridge this accessibility gap by designing and developing a specialized, website-based digital dictionary focused on the most common Quranic terms. The primary contribution is an interactive and inclusive platform that integrates Arabic script, transliteration, and meaning with corresponding sign language video interpretations. The Agile Development methodology was employed, allowing for a flexible and iterative process to effectively address user feedback. This lifecycle involved key stages such as requirements planning, system modeling using UML and ERD, backend development with the Laravel framework, and functional validation via black-box testing. The testing phase demonstrated highly positive outcomes; functional validation via Black-Box testing confirmed that all system modules operated correctly according to specifications without any errors. Furthermore, the usability evaluation using the System Usability Scale (SUS) yielded an average score of 71, placing the platform in the "Good" category with an "Acceptable" level of usability.

**Keywords:** Digital Dictionary; Quranic Vocabulary; Sign Language; Deaf and Hard of Hearing; Web Accessibility.

### **1. INTRODUCTION**

The Quran serves as a guide to life for Muslims in this world and the hereafter [1]. Understanding and practicing the teachings of the Quran is an essential obligation for every Muslim. However, fulfilling this obligation is challenged by the reality that Allah the Almighty created His servants with diverse physical and sensory conditions, including individuals with special needs. According to data from the Ministry of Social Affairs through the Management Information System for Persons with Disabilities, 7.03% of people with disabilities in Indonesia are deaf [2], [3].

For Muslims, particularly those with hearing impairments, understanding the Quran often poses a significant challenge [4]. Their auditory limitations prevent them from fully engaging in conventional learning methods, which are typically audio- or lecture-based. Furthermore, the general public largely lacks an understanding of sign language due to its infrequent use in daily life, resulting in difficulties when communicating with the deaf and mute [5]. This situation exacerbates the communication gap and restricts access to inclusive learning.

Based on data from the World Federation of the Deaf (WFD), approximately 80% of individuals with hearing impairments have a low educational background, with some even being illiterate or possessing only basic literacy skills [6]. This results in an inability to learn, read, and comprehend the meaning and exegesis (tafsir) of the Quran as easily as the general population, which also hinders them from performing Islamic rituals, such as prayer (salah), that necessitate learning and reading the Quran [7]. Furthermore, the available learning media remains highly limited; it is exceedingly difficult, if not impossible, to find educational resources whether physical books or electronic media suitable for the deaf to learn Hijaiyah letters [8]. Consequently, existing methods do not fully align with the visual and dynamic characteristics of sign language. This condition causes deaf Muslims to frequently experience difficulties in comprehensively understanding the vocabulary and verses of the Quran.

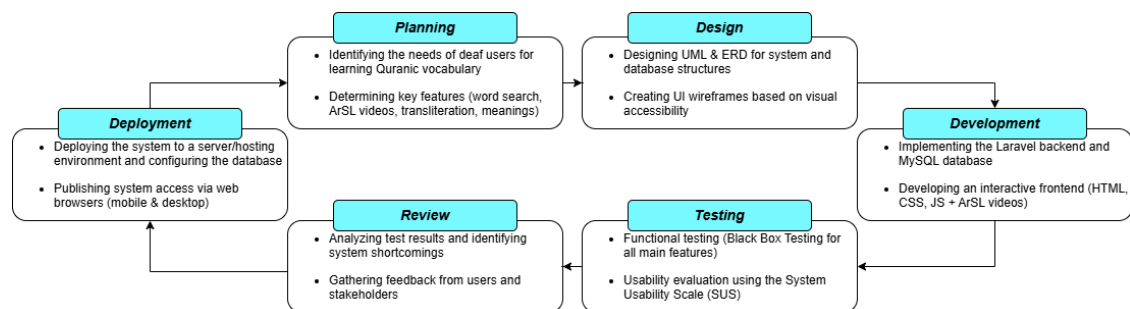
Recent advancements in digital technology have introduced various innovations in the field of education and learning. Web-based applications represent a form of digital technology with high accessibility and flexibility, capable of delivering interactive learning materials tailored to individual needs [9]. Supported by web platforms, individuals with hearing impairments can utilize devices such as smartphones and computers to facilitate cooperative learning through interactive boards and integrated content, enabling them to access educational materials anytime and anywhere [10]. Furthermore, the translation of Arabic text into Arabic Sign Language (ArSL) is crucial for the full integration of the deaf into their communities [11].

Despite previous efforts in digitalizing Islamic educational resources, a significant research gap remains. Existing Quranic digital dictionaries are predominantly designed for the general public, heavily relying on textual and auditory elements without incorporating sign language visualizations. Conversely, while some sign language applications exist, they generally focus on everyday vocabulary rather than specific Quranic terminology. Therefore, the primary contribution of this article is to address these limitations by developing a specialized web-based dictionary that seamlessly integrates the most common Quranic vocabulary with Arabic Sign Language (ArSL) videos. This system provides a tailored, interactive solution that previous applications failed to offer, effectively bridging the accessibility gap for the Deaf and Hard of Hearing community.

Recognizing the potential of web technology in supporting inclusive education, there is a critical need for a medium capable of interactively presenting Quranic vocabulary through sign language. To address this, this study develops a web-based interactive digital dictionary that provides the meanings of the most common vocabulary in the Quran, alongside their representations in Arabic Sign Language (ArSL). This platform is expected to serve as an innovative and inclusive learning tool for deaf Muslims, as well as a concrete step toward achieving equitable access to understanding the Quran for the entire Muslim community.

## 2. RESEARCH METHODOLOGY

This study implements the Agile Development methodology for its system development. This approach was selected due to its high degree of flexibility in accommodating evolving user requirements, as well as its iterative and incremental development cycles [12]. Such an approach is particularly relevant to the nature of this research, which involves individuals with hearing impairments, thereby necessitating a development process that is highly adaptable and responsive to user feedback. Consequently, each phase of this method is executed iteratively to ensure that the resulting web-based interactive digital dictionary comprehensively aligns with user needs, offers high usability, and effectively supports Quranic learning for deaf Muslims.



**Fig 1.** Stages of the Agile Method

Figure 1 illustrates the stages of the Agile Development methodology employed in this study. Each phase is executed iteratively to ensure that the web-based interactive digital dictionary system can be continuously adapted and refined according to user needs.

Operationally, the Agile development was executed in structured iteration stages (sprints), with each cycle focusing on specific core functionalities. For instance, the initial iterations prioritized the backend architecture and authentication systems, while subsequent iterations focused on the vocabulary search engine, visual interface, and ArSL video integration. This incremental approach ensured that any technical or usability issues identified during the review phase could be immediately addressed in the next cycle.

### 2.1 Planning

The planning phase is the initial stage in the Agile methodology, aiming to elicit user requirements, analyze system needs, and define development objectives [13]. In this phase, data collection was conducted operationally through literature reviews, direct observations, and structured interviews involving approximately 13 deaf students and 10 special education teachers directly at a Special Education School (Sekolah Luar Biasa) to comprehensively identify their specific learning barriers. Furthermore, to guarantee the integrity of the educational material, a rigorous validation mechanism was established for the sign language content. Specifically, the Arabic texts, transliterations, Indonesian translations, and the corresponding ArSL video demonstrations were sourced from and strictly validated against the official Quranic Sign Language guidelines issued by the Indonesian Ministry of Religious Affairs (Kemenag) prior to their integration into the database. The outcomes of this phase serve as the foundation for designing the features and functionalities of the web-based interactive digital dictionary to ensure alignment with user needs. The identified system requirements are presented in Table 1.

**Table 1.** Requirements Analysis

| No | Requirement Category               | Description                                                                                                                          |
|----|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Qur'anic Vocabulary Representation | The system presents the most common Quranic vocabulary in Arabic text (Uthmani script), transliteration, and Indonesian translation. |
| 2  | Sign Language Integration (ArSL)   | Each vocabulary entry is accompanied by an Arabic Sign Language (ArSL) video as the primary visual learning medium.                  |

|   |                                      |                                                                                                                            |
|---|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| 3 | Visual Accessibility Interface       | The interface is designed based on visual learning principles (icons, simple layout, minimal complex text) for deaf users. |
| 4 | Interactive Search & Navigation      | The system provides a quick search feature and navigation based on vocabulary categories.                                  |
| 5 | Content Management for ArSL Media    | Administrators can dynamically manage vocabulary content and sign language videos via a dashboard.                         |
| 6 | Cross-Platform Learning Access       | The system can be accessed through various devices (mobile and desktop) without requiring app installation.                |
| 7 | User Feedback & Learning Improvement | The system provides a user feedback feature to evaluate the quality of sign videos and learning content.                   |

## 2.2 Design

The design phase is the system design process rooted in the requirements analysis conducted during the planning phase. In this stage, developers design the data structures, logical flows, and user interfaces to ensure that the digital dictionary application operates in accordance with user expectations. This design serves as a foundational blueprint for the subsequent implementation and testing phases. The system design is represented using Unified Modeling Language (UML) modeling, specifically comprising Use Case Diagrams and Activity Diagrams, and is further complemented by Wireframes and an Entity Relationship Diagram (ERD) [14].

### 2.2.1 Use Case Diagram

Use Case Diagram serves to visualize the interactions between actors (users) and the developed system. This diagram is essential for illustrating user behavior and documenting system requirements [15]. It outlines the various core functionalities accessible to users within the system. The use case diagram for the web-based interactive digital dictionary system is presented in Figure 2.

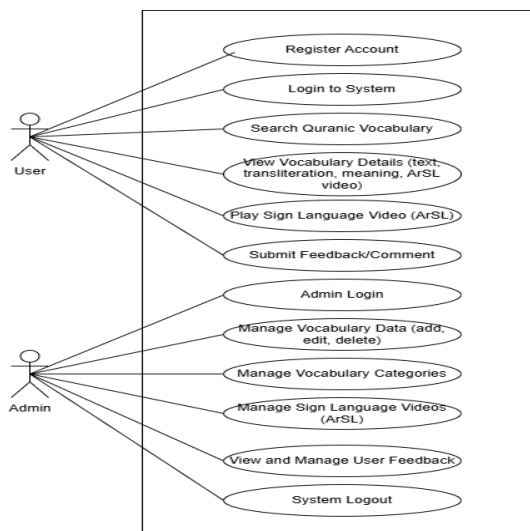


Fig 2. Use case diagram

### 2.2.2 Activity Diagram

Activity Diagram is a UML diagram that represents workflows or business processes within a system. Activity Diagrams also visualize the processes that occur during system execution. In the development of this "Web-Based Digital Dictionary for the Most Common Vocabulary in the Quran," there are two primary activity diagrams depicting the system's workflow, specifically for the Admin and User actors.

Figure 3 illustrates the Activity Diagram for the Admin actor, which proceeds linearly. The workflow begins with accessing the admin page and inputting credentials. Following successful authentication, the Admin can perform a series of management tasks within the system, encompassing the "Manage Vocabulary Data," "Manage Categories," and "Manage Videos" menus. The flow concludes when the Admin selects "Logout" and the system terminates the session.

Figure 4 illustrates the Activity Diagram for the User actor. After successfully navigating the authentication page, the User can perform a vocabulary search. The system will then display the details of the selected vocabulary. From

this detail page, the User can play the Arabic Sign Language (ArSL) video and submit feedback. The workflow concludes when the User selects "Logout."

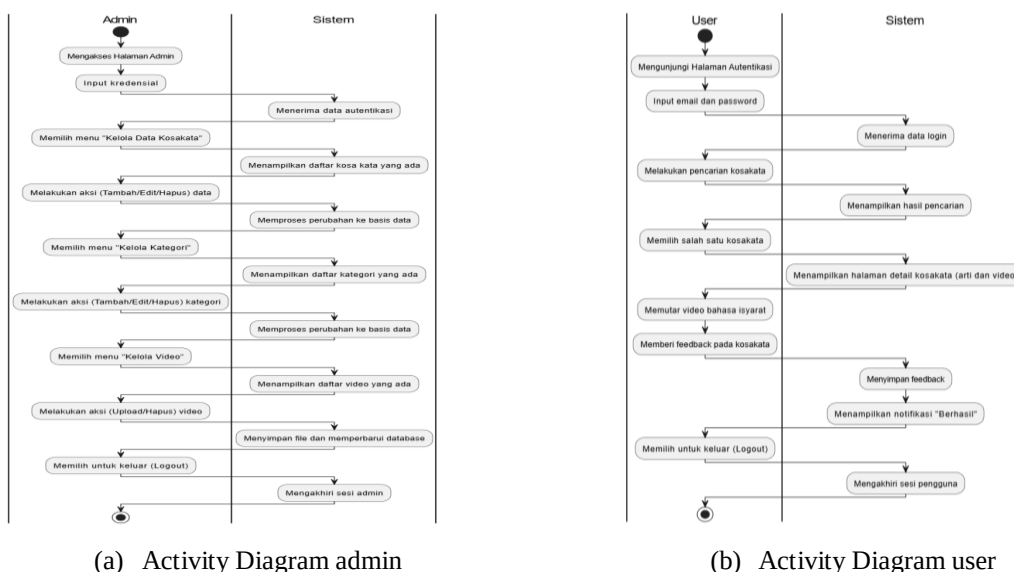


Fig 3. (a) Activity Diagram admin and (b) Diagram user

## 2.2.3 Entity Relationship Diagram

Entity Relationship Diagram (ERD) is a database architecture design technique that serves to map the structural entities within a system and describe the relationships among them [16]. The ERD for the system, which is designed to facilitate the searching and learning of Quranic vocabulary along with Arabic Sign Language (ArSL) visualizations, is presented in Figure 5.

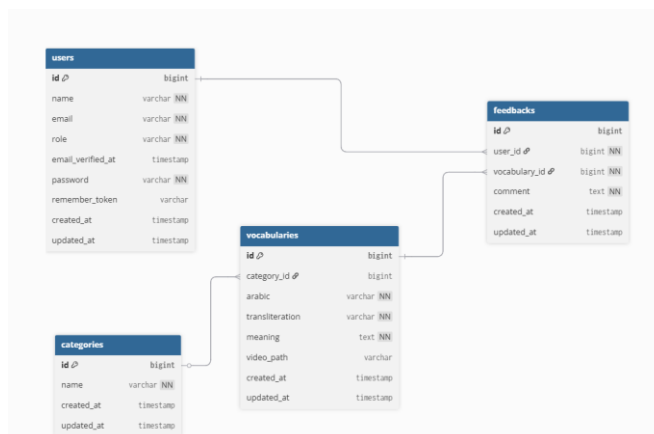


Fig 4. Entity Relationship Diagram

## 2.2.4 Wireframe

wireframe is a visual framework or a low-fidelity blueprint of a user interface (UI). It focuses entirely on structure, page layout, and navigation flow, typically depicted using only boxes, lines, and simple grayscale text. Its primary objective is to logically plan the placement of key elements and functionalities prior to proceeding with detailed visual design elements, such as color schemes and typography.

## 2.3 Development

The development phase is the stage where the design outcomes are realized into a functional and operational system. Through structured planning, meticulous implementation, and comprehensive testing, this phase aims to produce software of optimal quality [17]. During this stage, the ERD design is implemented into a physical MySQL database. Meanwhile, the logical flows and wireframe interfaces are translated into source code using the Laravel (PHP) framework for the backend, alongside HTML, CSS, and JavaScript for the frontend. The development of this "Web-Based Digital



Dictionary System for the Most Common Vocabulary in the Quran" is executed iteratively on a per-feature basis, commencing with the Login feature before advancing to the Vocabulary Search feature.

## 2.4 Testing

Testing is the process of validating an application's functionality and usability, conducted upon the completion of a feature's development to identify bugs or errors [18]. The testing methodologies utilized in this research encompass two distinct approaches: Black-Box Testing for functional validation and the System Usability Scale (SUS) for usability evaluation.

Black-Box testing focuses on the functional specifications of the software. This testing approach evaluates a set of input conditions and verifies the functional descriptions of the program [19], [20]. Meanwhile, the System Usability Scale (SUS) is a user evaluation method that provides a practical and rapid measurement instrument, yet remains proven reliable in its application. It is utilized to measure the system's ease of use for end-users through a standardized 10-item questionnaire, which was operationally administered to 30 respondents from the Deaf and Hard of Hearing community. This process yields a subjective perception score regarding the usability of this digital dictionary's interface [21].

## 2.5 Review

Review and Feedback represent the core of the iterative approach in Agile methodology. This phase constitutes an interactive process wherein clients and developers communicate to provide feedback on the generated system output, thereby facilitating potential changes for solutions or enhancements [22], [23]. Once a feature successfully passes the testing phase, the resulting working software is demonstrated to stakeholders which, in the context of this study, may include academic supervisors or fellow researchers. This review session aims to gather rapid feedback concerning functionality, user flow, and the appropriateness of the user interface (UI). All acquired feedback, such as proposed refinements or overlooked bugs, is compiled and incorporated into the product backlog, to be prioritized in the subsequent development cycle. This cycle (Development - Testing - Review) is iterated continuously until all core functionalities defined within the Use Case Diagram have been completely developed.

## 2.6 Deployment

Deployment represents the final stage of the development process, executed once all core functionalities are deemed complete, have passed final testing, and have been approved during the final review session. In this phase, the "Web-Based Digital Dictionary for the Most Common Vocabulary in the Quran" application is uploaded, configured, and released to a web hosting environment or production server. The primary objective is to bring the system online, ensuring it is publicly accessible to both Users and Admins via the internet.

# 3. RESULT AND DISCUSSION

This research has successfully realized a web-based Quranic Vocabulary Digital Dictionary system, developed using the Laravel framework and MySQL database. The system implementation phase was conducted by strictly adhering to the use case specifications and wireframe designs established during the design phase.

## 3.1 Result

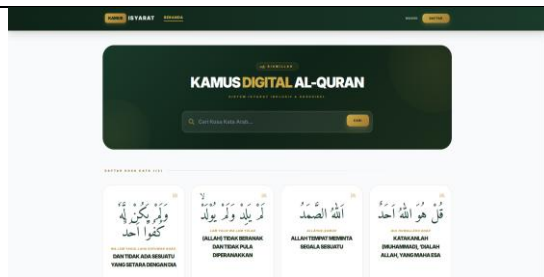
### 3.1.1 Home Page

The home page serves as the primary interface, functioning as the central hub for navigation and vocabulary searches within the Quranic Digital Dictionary system. This interface is designed to facilitate users in locating keywords through a centrally positioned search bar within the hero section. Furthermore, the content is presented using a card system that integrates Arabic text, transliteration, and Indonesian translations to provide clear visual information for the deaf community before they access the sign language details. The layout of the home page is presented in Figure 6.

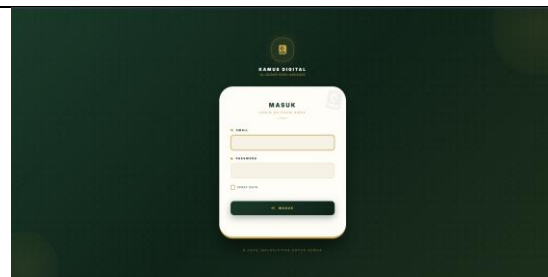
### 3.1.2 Login Page

The login page is an authentication interface designed for users who wish to provide feedback on the sign language videos. This interface features a minimalist layout that includes input fields for email and password, alongside a primary access button positioned with high contrast to facilitate navigation. The design implementation prioritizes both security and ease of use for the deaf community when initiating interaction with the system. The login page interface is presented in Figure 7.





(a) Home page



(b) Login page

Fig 5. (a) Home page and (b) Login page

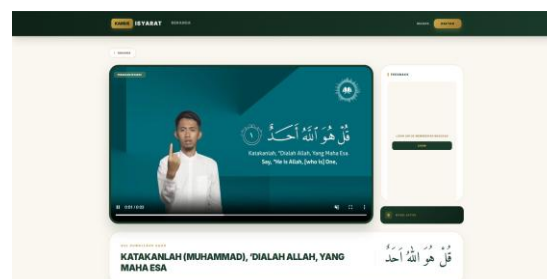
### 3.1.3 Sign Language Detail Page

The sign language detail page presents the visualization of Quranic vocabulary or verses through Arabic Sign Language demonstration videos. This interface is equipped with an interactive video player, verse text in the Uthmani script, and Indonesian translations to enhance the understanding of the deaf community. Furthermore, a feedback section is positioned on the right side to facilitate user interaction and collect input regarding the presented content. The layout of the sign language detail page is shown in Figure 8.

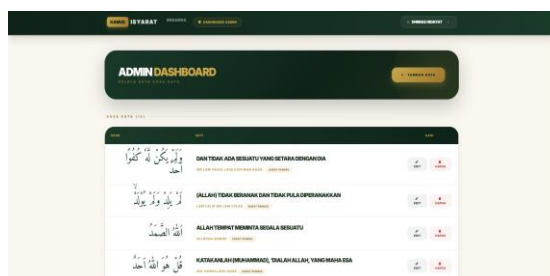
### 3.1.4 Admin Sign Language Management Page

The admin dashboard serves as the central control hub for administrators to manage the dictionary data. This interface displays a comprehensive list of vocabulary, including the Arabic text and its meanings, equipped with action buttons to add, edit, and delete data efficiently. The layout of this page is presented in Figure 9.

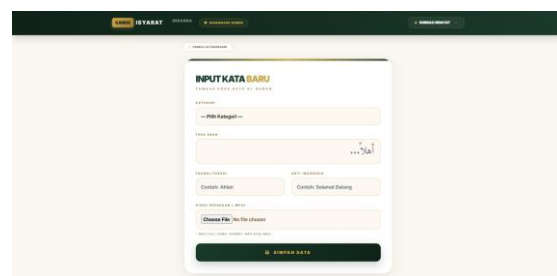
The vocabulary input page functions as a form for administrators to add new data to the system. This interface features structured input fields encompassing category selection, Arabic text, transliteration, Indonesian translation, and a video upload feature for sign language demonstrations. The layout of this page can be viewed in Figure 10.



(a) Sign Language Detail Page



(b) dashboard admin page



(c) Input vocabulary page

Fig 6. (a) Sign language detail page, (b) dashboard admin page and (c) input vocabulary page

## 3.2 Testing

### 3.2.1 Black Box Testing

Black-box testing aims to identify vulnerabilities or bugs within the developed application, ensuring that follow-up actions and refinements can be promptly executed to enhance the overall quality of the system [24]. The detailed results of this functional testing are summarized in Table 2.



Table 1. Black Box Testing

| No | Feature              | Test Scenario                                    | Input Data                                                   | Expected Result                                                  | Test Conclusion                             |
|----|----------------------|--------------------------------------------------|--------------------------------------------------------------|------------------------------------------------------------------|---------------------------------------------|
| 1  | Admin Authentication | Logging in using a registered admin account      | Valid admin email and password                               | System redirects user to the /admin page                         | Successfully entered the admin panel        |
| 2  | User Authentication  | Logging in using a registered user account       | Valid user email and password                                | System redirects user to the home page                           | Successfully entered the home page          |
| 3  | Authentication       | Logging in with an incorrect password            | Valid email, incorrect password                              | System denies login and displays an error message                | Login rejection worked as expected          |
| 4  | Account Registration | Registering a new user account                   | Valid name, email, and password                              | System saves new account data to the database                    | New account successfully created            |
| 5  | Manage Vocabulary    | Adding new vocabulary data                       | Complete Arabic text, transliteration, meaning, and category | System saves the new vocabulary data                             | Vocabulary data saved correctly             |
| 6  | Manage Vocabulary    | Modifying existing vocabulary data               | Changes to the vocabulary meaning field                      | System updates the data in the database                          | Data changes successfully applied           |
| 7  | Manage Vocabulary    | Deleting specific vocabulary data                | Clicking the delete button on selected data                  | System removes the data from the database                        | Data successfully deleted from the system   |
| 8  | Search               | Searching for vocabulary by keyword              | Arabic or Indonesian keywords                                | System displays relevant search results                          | Search results displayed according to input |
| 9  | Vocabulary Detail    | Opening the details of a vocabulary item         | Clicking on a specific vocabulary item                       | System displays Arabic text, transliteration, meaning, and video | Complete vocabulary details displayed       |
| 10 | Feedback             | Submitting a comment/feedback                    | Comment with a minimum of 5 characters                       | System saves the comment to the database                         | Feedback successfully saved                 |
| 11 | Access Rights        | Regular user attempting to access the admin page | Logged in as a user then accessing /admin                    | System denies access and displays a 403 error or redirect        | Admin access correctly blocked              |
| 12 | Access Rights        | Unauthenticated user accessing the admin page    | Accessing /admin without logging in                          | System redirects the user to the login page                      | Redirect to login worked correctly          |

The flawless execution of all test scenarios in the Black-Box testing indicates that the system's core functional logic ranging from secure authentication and CRUD (Create, Read, Update, Delete) operations to the seamless playback of ArSL videos is robust and reliable. This functional stability is crucial, as it ensures that deaf users can navigate the dictionary and access video materials without encountering technical disruptions that could hinder their visual learning process.

### 3.2.2 System Usability Scale (SUS)

The System Usability Scale (SUS) is a system testing phase employed to measure the levels of user satisfaction and usability of the implemented system [25]. The SUS score calculation is based on user responses to 10 questionnaire items measured using a 5-point Likert scale. The scoring rules stipulate that for odd-numbered statements, the score is calculated by subtracting 1 from the respondent's score. Meanwhile, for even-numbered (negatively worded) statements, the score is obtained by subtracting the respondent's score from 5. The total sum of the scores from all ten items is then multiplied by a factor of 2.5 to produce the final score on a scale of 0 to 100.

Table 2. SUS Scoring Result

| No | Respondent   | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Total | Score<br>(Total x 2.5) |
|----|--------------|----|----|----|----|----|----|----|----|----|-----|-------|------------------------|
| 1  | Respondent 1 | 4  | 4  | 4  | 4  | 4  | 4  | 0  | 4  | 0  | 4   | 32    | 80                     |
| 2  | Respondent 2 | 4  | 4  | 4  | 4  | 4  | 4  | 4  | 4  | 4  | 4   | 40    | 100                    |
| 3  | Respondent 3 | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 1   | 28    | 70                     |



|                              |               |   |   |   |   |   |   |   |   |   |   |    |    |
|------------------------------|---------------|---|---|---|---|---|---|---|---|---|---|----|----|
| 4                            | Respondent 4  | 3 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 9  | 23 |
| 5                            | Respondent 5  | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 29 | 73 |
| 6                            | Respondent 6  | 3 | 2 | 2 | 1 | 2 | 2 | 3 | 2 | 2 | 1 | 20 | 50 |
| 7                            | Respondent 7  | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 3 | 3 | 1 | 26 | 65 |
| 8                            | Respondent 8  | 3 | 3 | 3 | 2 | 2 | 1 | 3 | 3 | 3 | 1 | 24 | 60 |
| 9                            | Respondent 9  | 3 | 3 | 4 | 4 | 3 | 4 | 3 | 4 | 4 | 3 | 35 | 88 |
| 10                           | Respondent 10 | 3 | 4 | 4 | 2 | 3 | 2 | 1 | 1 | 1 | 2 | 23 | 58 |
| 11                           | Respondent 11 | 4 | 2 | 4 | 2 | 4 | 3 | 2 | 2 | 4 | 0 | 27 | 68 |
| 12                           | Respondent 12 | 3 | 4 | 4 | 4 | 3 | 4 | 3 | 4 | 3 | 3 | 35 | 88 |
| 13                           | Respondent 13 | 3 | 1 | 3 | 1 | 4 | 1 | 3 | 1 | 3 | 1 | 21 | 53 |
| 14                           | Respondent 14 | 4 | 3 | 4 | 3 | 4 | 4 | 4 | 3 | 3 | 1 | 33 | 83 |
| 15                           | Respondent 15 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 0 | 32 | 80 |
| 16                           | Respondent 16 | 4 | 4 | 4 | 4 | 3 | 4 | 3 | 4 | 3 | 0 | 33 | 83 |
| 17                           | Respondent 17 | 3 | 3 | 3 | 3 | 4 | 3 | 4 | 3 | 3 | 1 | 30 | 75 |
| 18                           | Respondent 18 | 4 | 3 | 4 | 3 | 4 | 4 | 4 | 3 | 3 | 0 | 32 | 80 |
| 19                           | Respondent 19 | 2 | 4 | 3 | 4 | 3 | 3 | 3 | 4 | 3 | 0 | 29 | 73 |
| 20                           | Respondent 20 | 3 | 3 | 4 | 4 | 4 | 3 | 4 | 3 | 3 | 1 | 32 | 80 |
| 21                           | Respondent 21 | 4 | 1 | 4 | 3 | 3 | 3 | 3 | 3 | 4 | 0 | 28 | 70 |
| 22                           | Respondent 22 | 3 | 4 | 3 | 4 | 4 | 0 | 2 | 4 | 4 | 0 | 28 | 70 |
| 23                           | Respondent 23 | 4 | 1 | 4 | 4 | 4 | 2 | 4 | 4 | 4 | 2 | 33 | 83 |
| 24                           | Respondent 24 | 2 | 1 | 2 | 4 | 4 | 0 | 2 | 3 | 4 | 0 | 22 | 55 |
| 25                           | Respondent 25 | 4 | 4 | 3 | 4 | 4 | 2 | 4 | 1 | 1 | 2 | 29 | 73 |
| 26                           | Respondent 26 | 3 | 1 | 2 | 4 | 4 | 2 | 1 | 2 | 4 | 0 | 23 | 58 |
| 27                           | Respondent 27 | 3 | 0 | 4 | 4 | 4 | 0 | 4 | 1 | 3 | 3 | 26 | 65 |
| 28                           | Respondent 28 | 2 | 3 | 2 | 4 | 4 | 0 | 3 | 3 | 3 | 3 | 27 | 68 |
| 29                           | Respondent 29 | 1 | 4 | 3 | 4 | 4 | 2 | 2 | 2 | 4 | 2 | 28 | 70 |
| 30                           | Respondent 30 | 4 | 2 | 4 | 4 | 4 | 0 | 4 | 3 | 3 | 4 | 32 | 80 |
| Average Score (Final Result) |               |   |   |   |   |   |   |   |   |   |   |    | 71 |

Referring to the data in Table 3, the Quranic Digital Dictionary achieved an average score of 71, solidifying the system's position within the 'Good' category with an 'Acceptable' level of usability. This positive reception can be primarily attributed to the interface's emphasis on visual accessibility. The utilization of a minimalist card layout, clear iconography, and the direct integration of ArSL videos alongside the Uthmani script aligns perfectly with the visual learning preferences of the deaf community.

However, a critical analysis of the individual scores reveals that several respondents (e.g., Respondents 4, 13, 24, and 26) provided significantly lower evaluations, with scores ranging from 23 to 58. Based on direct observations during the testing phase, these lower scores were generally given by users who were less familiar with navigating web-based interfaces or those who experienced technical constraints, such as buffering during video playback due to network connectivity issues. To address this, possible future improvements include the implementation of an interactive onboarding tutorial (guided tour) for first-time users and further optimization of video file sizes to ensure smoother playback across various device specifications and network conditions.

## 4. CONCLUSION

This research has successfully realized the development of a web-based Quranic Digital Dictionary system focused on the most common vocabulary in Arabic Sign Language (ArSL). Through the implementation of the Laravel framework and MySQL database, this system provides a responsive and inclusive platform for the deaf community. The





applied Agile Development methodology proved highly effective in ensuring that every development cycle from planning to deployment proceeded iteratively and adaptively toward user needs. Key featured functionalities include interactive vocabulary search, precise presentation of Uthmani script text, and sign language demonstration videos that clarify the visual understanding of verse meanings. Based on the validation results, Black-Box Testing confirmed that all functional modules, including the authentication system and content management, operate according to specifications without errors. Furthermore, according to the evaluation using the System Usability Scale (SUS) method, the system achieved an average score of 71. This score places the application in the "Good" category with an "Acceptable" level of usability. This indicates that the designed interface meets sound web accessibility standards. Consequently, this system is highly suitable for implementation as an innovative learning medium to bridge the gap in Quranic literacy access for individuals with hearing impairments in an independent and structured manner. Despite the successful implementation, this research has several limitations that should be addressed in future studies. Currently, the dictionary's database is limited to the most common Quranic vocabulary and does not yet cover the entirety of the Quranic text. Furthermore, the system is highly dependent on stable internet connectivity for seamless ArSL video playback, and the usability testing was confined to a specific demographic of 30 respondents at a single Special Education School. Therefore, future developments should focus on expanding the vocabulary database comprehensively. Additionally, developing a dedicated mobile application with offline viewing capabilities is highly recommended to minimize internet dependency. Finally, integrating interactive features such as AI-based sign language recognition could provide real-time evaluation and feedback for users, further enhancing their independent learning experience.

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