

Quranpedia Website Development Using the Joint Application Development Method

Sarja Asra Winata*, Eko Darwiyanto, Moch Arif Bijaksana

School of Computing, Software Engineering, Telkom University, Bandung, Indonesia

Email: ^{1,*}asrawinata@student.telkomuniversity.ac.id, ²ekodarwiyanto@telkomuniversity.ac.id, ³arifbijaksana@telkomuniversity.ac.id

Correspondence Author Email: asrawinata@student.telkomuniversity.ac.id

Abstract—Quranpedia is a website built with codeigniter framework to facilitate muslims in searching for nouns and the verses containing the same nouns in the Quran by following structure of Wikipedia. The research employs the Joint Application Development in the process of developing the website and use black box testing to asses the functionality of the website according to the requirements. During the system requirements analysis process, Joint Application Development (JAD) relies on the active engagement of stakeholders to precisely capture users' viewpoints regarding business needs and collaboratively devise solutions. The extensive participation of stakeholders guarantees the effective representation of their opinions, fostering a collective effort in the development of solutions. To evaluate the website's functionality, black box testing is employed, and the results unequivocally demonstrate its high effectiveness in meeting all the specified criteria. The user-friendly interface, coupled with its comprehensive and responsive features, significantly enhances the process of studying the Quran, making it accessible to a wider audience. As Quranpedia continues to evolve and improve, it is expected to serve as an invaluable aid for the Muslim community in deepening their understanding of the sacred Al-Quran. By providing easy access to nouns and their associated verses, Quranpedia empowers users to explore the profound meanings and teachings within the Quran's verses, fostering a stronger connection to their faith and enriching their spiritual journeys.

Keywords: Noun; Quran; Wikipedia; Codeigniter; Black Box Testing

1. INTRODUCTION

Arabic is one of the six primary languages worldwide, and it is the basis of the Arab world, but some Islamic countries also use the Arabic language as their primary language because it is the language of the Qur'an [1]. In the Islamic perspective, the Qur'an is a sacred book. It is a book filled with noble guidance and demands for the betterment, inspiring humans to seek acquaintance with the absolute truth that the soul yearns for [2]. The Holy Quran is the most important resource for the Islamic sciences and the Arabic Language [3]. Holy Quran is a scripture that is very long and rich in content where it consists of 30 juz (part), 114 surah, 6236 verses and written in Arabic. This can be a obstacle for most of Muslims who are not speak Arabic [4]. Learning the Arabic language does not have to be limited to academic institutions specializing in Arabic language. It can also be achieved by learning from Arabic language experts, through books, and through systems or applications that can assist Muslims in learning various types of words in the Arabic language. In the context of the Arabic language, *isim* refers to a grammatical term that plays a crucial role in the structure of the Quran, which is the holy book of Islam. The term *isim* can be broadly interpreted as a noun, and its significance extends far beyond its linguistic definition. Nouns in Arabic, particularly those found in the Quran, hold profound meanings that encapsulate the essence of various entities, whether tangible or intangible, concrete or abstract. According to [5], *Isim* (noun) is any word that has a meaning of an object, either concrete or abstract, without any element of time in it. One of the characteristics of *Isim* according to [5] is that it starts with AL (ال) prefix for example الكتاب. The nouns started with AL (ال) is the focus in Quranpedia website development. According to [6] Wikipedia has more than 50 million articles in approximately 300 languages. Today Wikipedia is the world's largest encyclopedia and one of the primary knowledge sources on the Web, providing content every day to millions of readers from across the globe in more than 160 actively edited languages [7]. From the capabilities of the Wikipedia encyclopedia, the "Quranpedia" website project emerged. The focus of this project will be on identifying for nouns (*isim*) and root words (mashdar) found in the Quran and Hadith books. Quranpedia is a website capable of displaying nouns and root words in the Arabic language sourced from the Quran and Hadith books. Quranpedia presents nouns, and upon clicking, it will provide related explanations similar to Wikipedia. The explanatory ability of Wikipedia regarding a particular topic makes it a reference for beginners to understand it. From this perspective, the idea of "Quranpedia" emerges, where each noun word in the Quran is explained, along with explanations from relevant Quranic verses. To facilitate the researchers in their study focusing on developing a website for detecting nouns in the Quran, Joint Application Method [8] is used as development methode, and CodeIgniter [9] is used as the website's development framework. The website owned by the Ministry of Religious Affairs (Kemenag) is considered as one of the reference sites for developing Quranpedia. It has an easily understandable interface and provides sufficient information on each page, with the main goal of ensuring good functionality. Its simple design also gives a sense of credibility to the Kemenag Quran website. The choice of colors and visual elements that are not overly busy can greatly influence the user experience on the Kemenag Quran website. Considering the combination of simplicity in design, non-cluttered visual elements, and effective information presentation, the Kemenag website was chosen as the main reference for Quranpedia in a JAD session voting process.

Based on the explanation above, the author is eager to contribute to the Quranpedia project by participating in the development of the The Quranpedia website utilizes the Joint Application Development method to identify and showcase Isim (nouns) contained in the Holy Quran and their respective usage in other surahs within the Quran. The author sincerely hopes to make a meaningful contribution to the development of Quranpedia.

2. RESEARCH METHODOLOGY

2.1 Software Development Methods

As mentioned above the Quranpedia project is inspired by Wikipedia, which provides explanation akin to an encyclopedia. Therefore, the Quranpedia website is developed to mimic the explanatory pattern of Wikipedia. The website is also designed to have a layout similar to that of the Quran, similar to the benchmark website Quran Kemenag, presenting each surah and verse one by one. As part of the Quranpedia project team, the researchers focus on developing the Quranpedia website. It will display the verses of the Quran, where each word in the verse can be clicked to navigate to a page showing the same noun from other verses found in the Quran. In building this Quranpedia website, the researchers apply the Joint Application Development (JAD) method. In the process of analyzing system requirements, Joint Application Development (JAD) involves the active participation of stakeholders to accurately depict users' perspectives on business needs and collaboratively develop solutions. The high level of stakeholder involvement ensures that their views are effectively represented, and together, they work towards developing solutions [8], [10]. In the Quranpedia project, Joint Application Design (JAD) was implemented in the selection of the website used as a reference for the development of Quranpedia through a vote led by the supervising lecturer, and specifying the requirements. Among various proposed reference sites, the Ministry of Religious Affairs' Quran website was chosen as the first option. JAD was also applied through both online and offline meetings to determine the objectives to be achieved in the Quranpedia project. The stages of this development are shown in Figure 1.

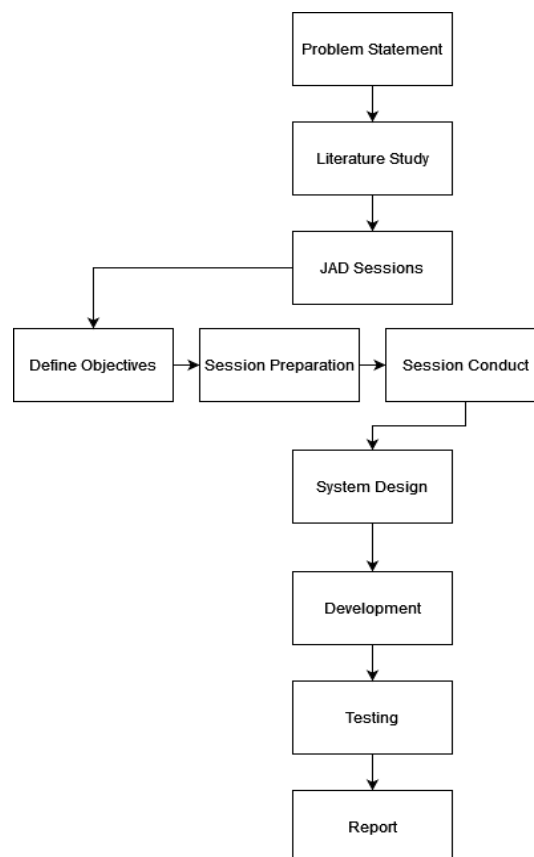


Figure 1. Software Development Flowchart

The flowchart shown in Figure 1 contains the stages in the development of the Quranpedia website, starting from the problem statement, literature study, and JAD sessions, which consist of :

- a. Define objective, which is to develop Quranpedia website with Quran Kemenag and Corpus Quran as benchmark websites.
- b. Literature study, the research team delved into previous studies related to the project. This process allowed them to gain valuable insights, identify potential challenges, and gather essential information to inform Quranpedia's development.
- c. JAD sessions.
- d. Session preparation, in this stage, each member of the Quranpedia team was assigned specific tasks during the session preparation stage, ensuring a well-coordinated and efficient workflow.
- e. Session conduct, With regular offline sessions every Monday and Thursday, the team engaged in brainstorming, knowledge sharing, and problem-solving under the guidance of a supervising lecturer, serving as the session leader.

- f. System design, in this stage, the author design the Quranpedia website using the CodeIgniter 4 framework, incorporating languages such as PHP [11], HTML [12], CSS [13], and JavaScript [14]. Additionally, an MySQL [15] database using phpMyAdmin [16] as an implementation was crucial to store and manage the Quranic verses and relevant data effectively.
- g. Development, Quranpedia is built by using Codeigniter framework[17], Codeigniter is one of the open-source PHP frameworks that utilizes the MVC (Model, View, Controller) method, which facilitates developers or programmers in building web-based applications without starting from scratch [9]. CodeIgniter uses MVC, Model View Controller (MVC) is a software development method by building applications by separating the data in the Model, the user interface in the View, and the data processing in the Controller. In general, this concept is a programming method that separates the main components of an application, namely the part that manipulates data, the user interface, and the part that controls the application [18].
- h. Testing, a critical phase to ensure Quranpedia's functionality aligned with its initial objectives. The black box testing method was employed to conduct comprehensive functional testing, verifying that the website met the intended goals. Black box testing is one of the software quality testing methods that focuses on the functions of the software. The purpose of black box testing is to discover incorrect functions, interface errors, errors in data structures, performance issues, initialization and termination errors [19].
- i. Report of testing results for the Quranpedia website, in this stage, the author thoroughly evaluating and documenting the testing outcomes. This process provided valuable insights into the website's performance, allowing the team to identify areas for improvement and further enhancement.

3. RESULT AND DISCUSSION

3.1 Planning

The development stage of Quranpedia begins with the establishment of the main project goal, which is to build a website capable of displaying Quranic verses and their corresponding nouns. The planning phase involves determining the necessary resources for the project, accomplished through JAD (Joint Application Development) meetings. This includes identifying the software tools and frameworks to be utilized in the development process. Among the chosen frameworks, Codeigniter chosen for its reliability, flexibility, and capacity to streamline the development process, ensuring the platform's robustness and responsiveness. To guarantee Quranpedia's functionality and meet the standards, the researcher opts for blackbox testing as the preferred testing method. This approach focuses on evaluating the external functionality of the website without delving into its internal intricacies. The team establishes a comprehensive project schedule, outlining key milestones and deadlines to ensure a seamless and timely execution of the project. Incorporating the identified requirements, the team focuses on developing the core functionality of Quranpedia, enabling users to access and study Quranic verses. They implement features that allow users to click on specific words within the verses to access information about their corresponding nouns.

3.2 Design

a. Activity Diagram

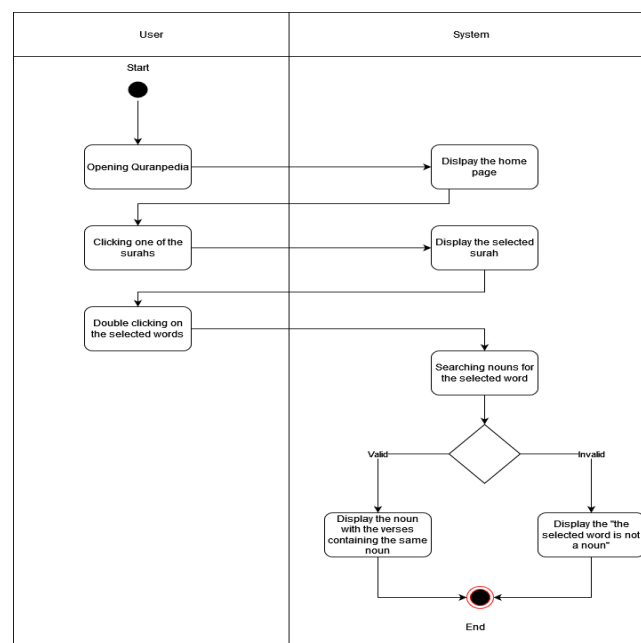


Figure 2. Activity Diagram

Figure 2 above presents a comprehensive overview of the step-by-step process that users follow when accessing Quranpedia, an user-friendly platform designed to facilitate exploration of the Quran and gain insightful knowledge about its verses and related nouns. The journey commences with the user opening Quranpedia, where they are greeted with an inviting and intuitive homepage that displays a list of all the surahs in the Quran.

Upon entering the site, users are greeted with homepage that displays a list of all the surahs in the Quran, by easily identifying and selecting a surah that piques their interest. The navigation allows them to immerse themselves in the verses of their chosen surah. As they explore into the depths of the sacred text, the interface provides a interactive experience by enabling users to click on specific words within the verses.

This feature allows users to uncover contextual nuances within the Quranic text. With a click, revealing the corresponding noun associated with the selected word. Quranpedia's thoughtful design ensures that users can grasp the essence of each word and its significance in the Quranic context.

Upon selecting a specific word, Quranpedia's interface promptly responds by displaying relevant information about the noun. Users are presented with an examples of how the noun is used throughout the Quranic scriptures.

b. Entity Relationship Diagram.

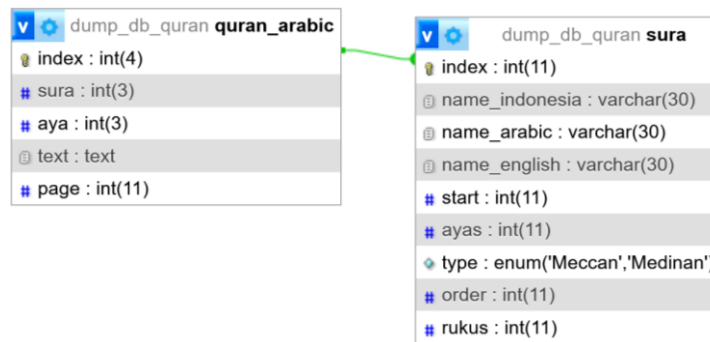


Figure 3. Entity Relationship Diagram

In Figure 3, the process of designing the database for Quranpedia involved a meticulously crafted and structured approach, where researchers employed a crucial and widely recognized technique known as the Entity Relationship Diagram (ERD). This pivotal step in the development journey laid the foundation for a robust and efficient database that forms the backbone of Quranpedia's seamless functionality and content organization. Entity Relationship Diagram or ERD is a structural diagram that used to design a database. An ERD describes the data to be stored in a system or limit. The main components contained in in an ERD is an entity set, relationship sets, and also constraints [20]

3.2 Implementation

This stage involves implementing the design into code. The following screenshots is the result of the implementation stage

a. Homepage

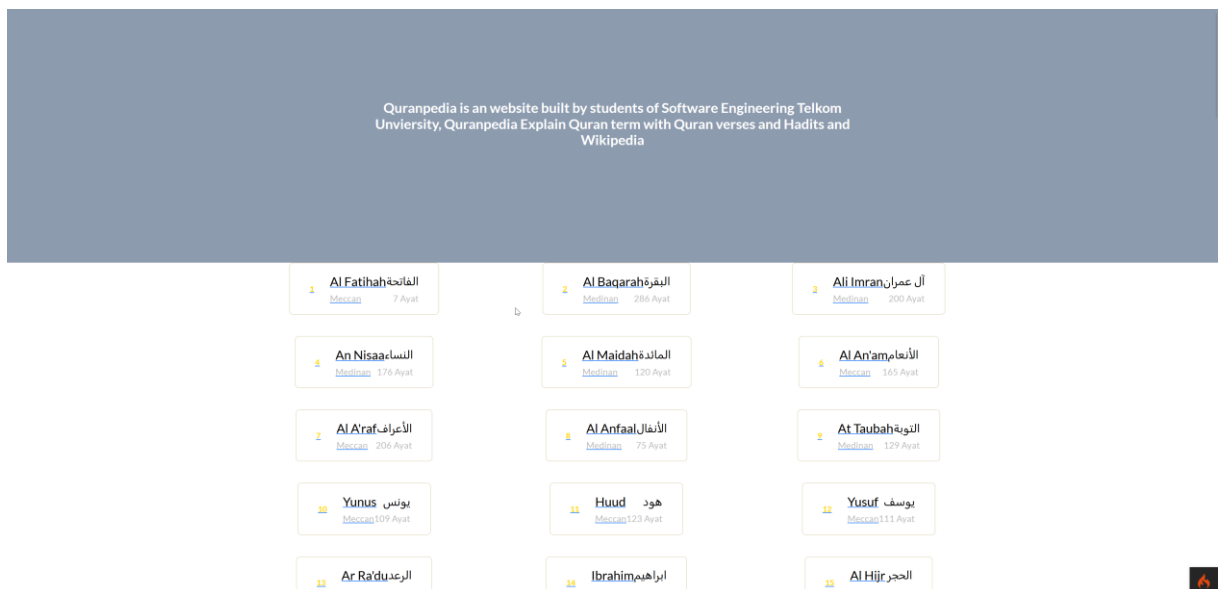


Figure 4. Homepage

In figure 4 shown above is the Homepage that users will see when opening the Quranpedia website. This page presents information in the form of a list of surahs found in the holy book, the Al-Quran. Its main role is to serve as the starting point for users to navigate and select the Quranic surah they want to study and explore. With a simple interface design, it displays the list of surahs available in the Al-Quran. Quranpedia's Homepage provides users with the opportunity to navigate through the contents of the Al-Quran and offers easy access to each surah. Users can effortlessly choose a specific surah they wish to study further. Thus, this Homepage functions as the primary gateway for users to explore the Al-Quran through Quranpedia.

b. Surah Page

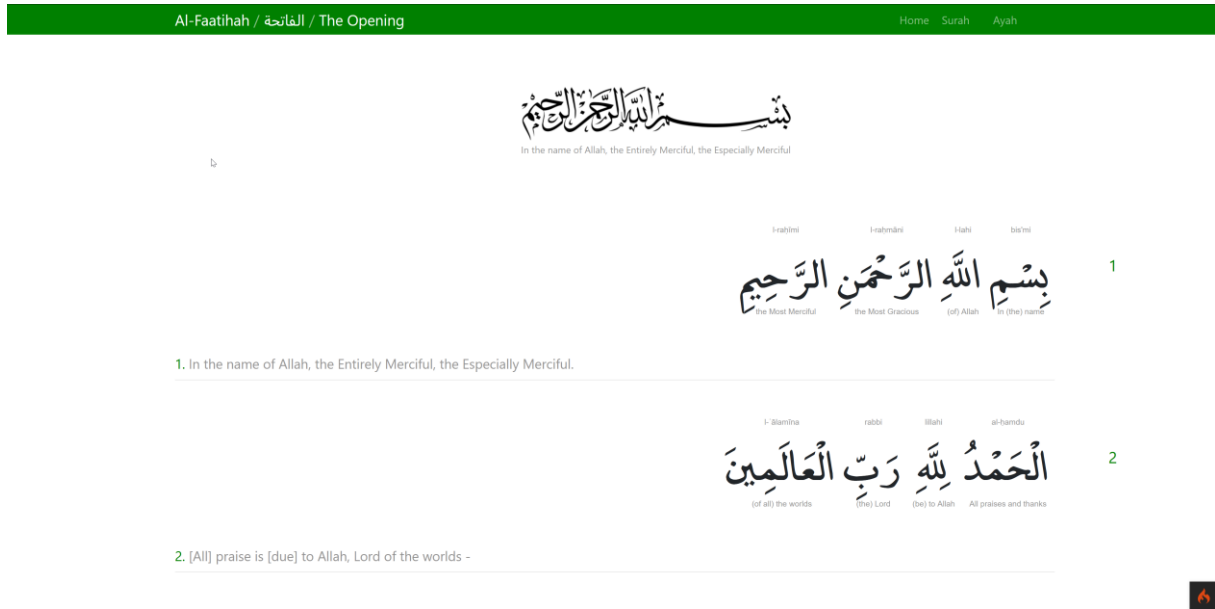


Figure 5. Surah Page

In figure 5 shown above is the Surah page that users will see when opening one of the surahs available on Quranpedia. This page is a continuation of the website's main page, which displays the list of surahs in the Al-Quran. The Surah page shows the verses of the specific surah that the user has selected from the previous page, which is the homepage of Quranpedia. Through this Surah page, users can access information within the surah, such as translations and word-by-word readings. On this page, users can explore the desired verses of the Al-Quran and access information about nouns by double-clicking on the selected verse. In summary, the Surah page allows users to delve into the verses of the Al-Quran they are interested in and provides access to information about nouns through a double-click action on the selected verse.

c. Nouns Page

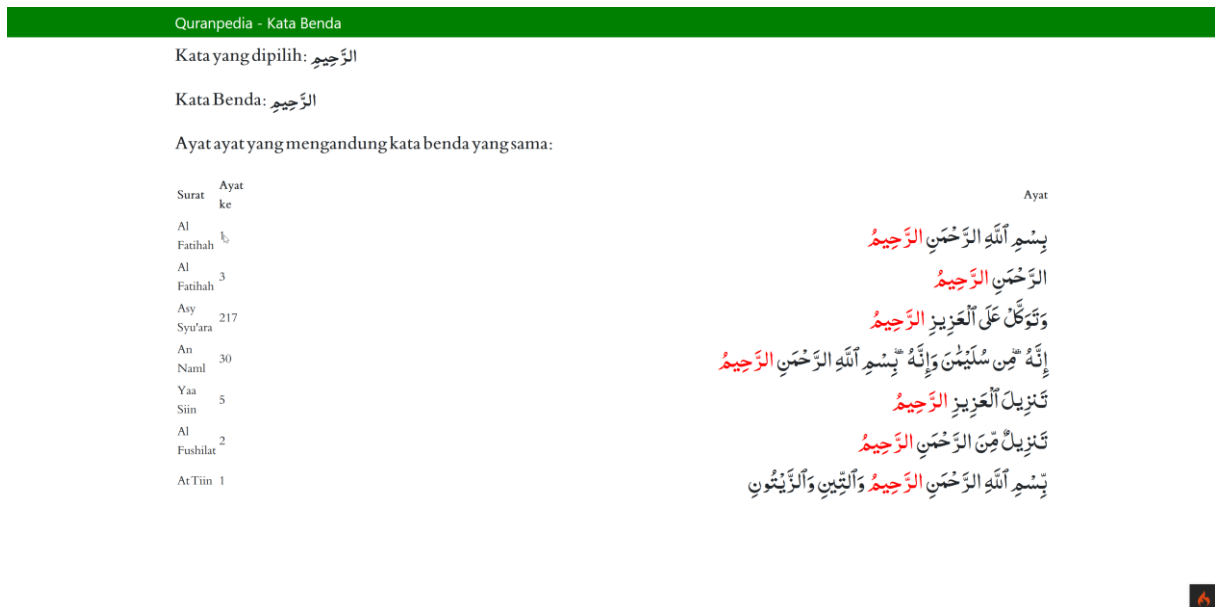


Figure 6. Nouns Page

In figure 6 shown above is the noun display that will be visible to the user when double-clicking on one of the words in the Al-Quran surah. It plays a role in showing nouns after the user selects a word on the previous page. On this noun page, the user is provided with information about the selected noun from the previous page and several surahs that contain the same noun. By highlighting the selected noun, this page can provide easily traceable information.

d. Surah Navigation

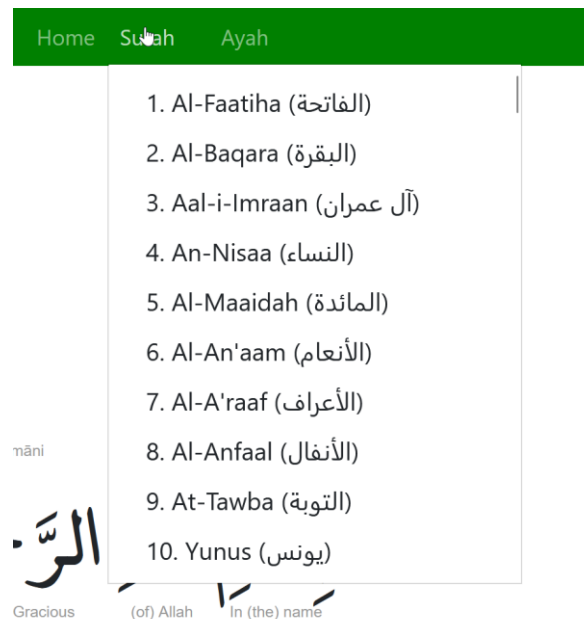


Figure 7. Surah Navigation

In figure 7 shown above is the surah navigation menu found on the Surah page of Quranpedia. This navigation menu contains a list of Al-Quran surahs that can be clicked by users, aiming to provide ease of navigation for users to explore the surahs in the Al-Quran. With its simple design, it optimizes users' exploration time, making it more efficient. By presenting a user-friendly navigation menu, Quranpedia allows users to conveniently access and select any surah they wish to study or read. This feature enhances the user experience and facilitates their journey through the verses of the Al-Quran. The straightforward design ensures that users can quickly find and access the specific surah they are interested in without any unnecessary complications. In summary, the surah navigation menu on the Quranpedia Surah page streamlines the process of exploring the Al-Quran for users, providing a user-friendly and efficient experience in accessing the different surahs.

e. Verses Navigation

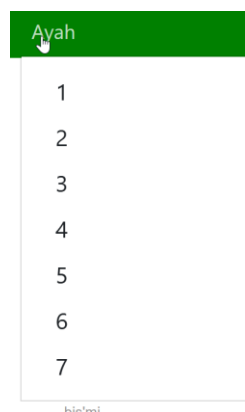


Figure 8. Verses Navigation

In figure 8 shown above is the interface of the verse navigation menu found on the Surah page of Quranpedia. Similar to the surah navigation, this verse navigation menu aims to assist users in easily navigating through the verses on the Quranpedia website. When users click the "Ayah" (verse) button, a dropdown menu will appear, allowing users to select a specific verse they wish to explore. This verse navigation feature enhances the user experience by providing a convenient way for users to access and study specific verses within a surah. With just a few clicks, users can swiftly jump to the verse of their choice, making their exploration of the Quran more efficient and seamless. Quranpedia's verse

navigation ensures that users can effortlessly delve into the details of each verse, helping them gain a deeper understanding of the Quranic text. By offering this user-friendly functionality, Quranpedia facilitates users in their journey to explore and learn from the sacred verses of the Al-Quran. In conclusion, the verse navigation menu on the Quranpedia Surah page provides a practical and accessible tool for users to navigate and study individual verses, further enriching their experience while using the Quranpedia website.

3.3 Testing

Testing plays a crucial role in evaluating the performance and effectiveness of the Quranpedia website, ensuring it achieves its established goals. To achieve this, the applied testing method is black-box testing, which focuses on assessing the external functionality of the system without delving into its internal implementation. This approach allows for a comprehensive examination of various aspects and features of Quranpedia to ensure its proper functioning and alignment with user expectations. The insights gained from this testing will be invaluable in determining the system's reliability and its ability to deliver a seamless and gratifying user experience. To ensure the accuracy and effectiveness of the testing process, a methodology is adopted, combining meticulous planning, systematic execution, and thorough documentation. The test cases cover different functionalities, including surah selection, verse exploration, noun identification, and information display. Each test procedure is meticulously designed to simulate real-world user interactions, ensuring that all critical elements of the website are scrutinized. The black-box testing methodology allows for a holistic assessment of Quranpedia's user interface, navigation, and content display, ensuring that users can seamlessly access and engage with the sacred teachings of the Quran. The insights gathered from this testing process will be instrumental in fine-tuning the website's performance, resolving any identified issues, and enhancing its overall functionality as shown in table 1 below.

Table 1. Testing

No.	Tests	Procedure	Expected Result	Actual Result
1	Choosing one of the surahs of the Al-Quran.	The test is conducted by opening the Quranpedia home screen and observing how the system responds to the user's selected Surah.	The system can display a list of surahs and direct the user to the page of the selected surah.	The system successfully display a list of surahs and direct the user to the page of the selected surah.
2	Choosing one of the nouns in a sura.	The test is conducted by opening one of the Quranpedia Surah pages and observing how the system responds to the user's selected noun.	The system can display the selected noun along with other verses containing the same noun.	The system successfully display the selected noun along with other verses containing the same noun.
3	Navigating from the surah page to the home screen	The test is conducted by opening one of the Quranpedia Surah pages and observing how the system responds when the user clicks on the home navigation menu.	The system can direct the user from the Surah page to the home screen.	The system successfully direct the user from the Surah page to the home screen.
4	Navigating from a surah page to another surah page.	The test is conducted by opening one of the Quranpedia Surah pages and observing how the system responds when the user selects one of the Surahs in the Surah navigation menu.	The system can direct the user from one Surah page to another Surah page.	The system successfully direct the user from one Surah page to another Surah page.
5	Navigating between verses in surah page	The test is conducted by opening one of the Quranpedia Surah pages and observing how the system responds when the user clicks on one of the verses in the verse navigation menu.	The system can direct the user to the intended verse within a Surah.	The system successfully direct the user to the intended verse within a Surah.

The expected results shown in table 1 above are defined based on the established goals of Quranpedia and its intended functionalities. These expected outcomes serve as benchmarks to assess the actual results obtained during the testing process. Any discrepancies between the expected and actual results are noted and thoroughly analyzed to identify potential issues and areas for improvement. The testing results in table 1 provide detailed information about each conducted test, expected results, and actual results. Black-box testing ensures Quranpedia functions as required, offering insights for improvements. Diligent testing optimizes user experience, meeting expectations. Insights gained contribute to continuous enhancement, making Quranpedia a valuable Quran exploration resource.

3.4 Analysis of test results

Based on the results of the comprehensive black-box testing conducted on Quranpedia, encompassing five key features, namely selecting Quranic Surahs, identifying nouns from Quranic verses, navigating between Surahs, and searching for specific verses, the system has proven to be highly effective in meeting all the test criteria. The thorough testing process has demonstrated that each feature in Quranpedia performs as expected, ensuring a seamless experience and meeting expectations. One of the aspects of Quranpedia is the Surah selection feature. Users can effortlessly navigate to their desired Surahs, allowing for a smooth and intuitive browsing experience. This design greatly enhances the overall experience, making it accessible and enjoyable for users of all levels of familiarity with the Quran. Moreover, the noun identifier within Quranic verses and its efficiency in providing comprehensive and responsive information about the nouns found within the verses. This invaluable tool significantly contributes to users understanding of the verses, helping them grasp the intricate meanings and context. The seamless navigation between Surahs further adds to the positive user experience. It facilitates smooth transitions while exploring different parts of the Quran, allowing users to delve deeper into the teachings and messages of the Holy Scripture effortlessly. Another feature is the verse navigation, which promptly grants access to specific verses. Users who seek particular passages from the Quran find this feature highly valuable and appreciated, saving time and effort and allowing them to focus on the content that matters most to them. The overall test results confirm that Quranpedia offers a highly satisfactory user experience, and it certainly meets the expected standards. Its reliability and effectiveness in assisting users with their learning and exploration of the Quran are well-established. The user-friendly interface, paired with the comprehensive and responsive features, truly elevates the process of studying the Quran. The insights gained from the testing phase are invaluable and will play a crucial role in the continuous enhancement and refinement of Quranpedia. This feedback can be used to further optimize the platform, ensuring it remains a trusted and valuable resource for users worldwide. By fostering a deeper understanding and appreciation of the Quran's teachings, Quranpedia serves as an essential tool for individuals seeking spiritual growth and knowledge. It stands as a testament to the powerful synergy between technology and religious studies, offering an immersive and enlightening experience to all its users. In conclusion, the positive results from the black-box testing underscore Quranpedia's dedication to providing a top-notch user experience and cement its status as a reliable and efficient platform for learning and exploring the teachings of the Quran. As the platform continues to evolve and grow, it will undoubtedly continue to impact the lives of users worldwide, fostering a stronger connection to the sacred text and enriching their spiritual journey.

4. CONCLUSION

This study has effectively accomplished its primary goal of establishing the Quranpedia website, designed akin to Wikipedia, with the purpose of presenting the AI-Quran and providing comprehensive information about its nouns. Through rigorous Joint Application Development (JAD) sessions, the researchers successfully set the requirements, selected website benchmarks, determined the layouts, and defined how the website responds to user interactions. These well-executed JAD sessions played a crucial role in guiding the development process, ensuring that Quranpedia meets its intended objectives and delivers an exceptional user experience. The development conducted thorough black box testing to evaluate the website's functionality, yielding satisfactory outcomes. However, the test results have also illuminated the necessity for further enhancements to improve the accuracy of search results for Quranic verses associated with selected nouns. This constructive feedback serves as valuable insights for future developments, aiming to refine Quranpedia's functionality and ensure consistent and precise information about nouns. In summary, this research makes a substantial contribution to the advancement of Quranpedia as a comprehensive and dependable online platform for users seeking to explore and comprehend the AI-Quran and its nouns. With its user-friendly interface and continuous efforts to enhance accuracy, Quranpedia becomes an invaluable reference source for the Muslim community, facilitating their study and appreciation of the Quranic verses and their relevant nouns. In conclusion, the successful establishment of Quranpedia stands as a commendable contribution to the progression of digital Islamic resources. As Quranpedia continues to expand and refine, it inspires to become an illuminating source of knowledge, fostering a deeper appreciation of the AI-Quran's teachings, and enriching the spiritual journeys of countless individuals worldwide. By empowering users with a wealth of information about the Quran's nouns, Quranpedia becomes an enduring repository of wisdom, serving as an inspiring reference for generations to come.

REFERENCES

- [1] A. Wahdan, S. Hantoobi, S. A. Salloum, and K. Shaalan, "A systematic review of text classification research based on deep learning models in Arabic language," *International Journal of Electrical and Computer Engineering*, vol. 10, no. 6, pp. 6629–6643, Dec. 2020, doi: 10.11591/IJECE.V10I6.PP6629-6643.
- [2] R. Ruslan, A. Bunyamin, and A. Achruh, "Pendidikan Spiritualisme dalam Perspektif Al-Quran," *Al-Musannif*, vol. 4, no. 2, pp. 101–118, Dec. 2022, doi: 10.56324/al-musannif.v4i2.72.
- [3] M. M. Alqahtani and E. Atwell, "Developing Bilingual Arabic-English Ontologies of Al-Quran," in *2018 IEEE 2nd International Workshop on Arabic and Derived Script Analysis and Recognition (ASAR)*, IEEE, Mar. 2018, pp. 96–101. doi: 10.1109/ASAR.2018.8480237.

- [4] Z. Indra, A. Adnan, and R. Salambue, "A Hybrid Information Retrieval for Indonesian Translation of Quran by Using Single Pass Clustering Algorithm," in 2019 Fourth International Conference on Informatics and Computing (ICIC), IEEE, Oct. 2019, pp. 1–5. doi: 10.1109/ICIC47613.2019.8985737.
- [5] M. R. Pratama and M. Yunus, "Sistem Deteksi Struktur Kalimat Bahasa Arab Menggunakan Algoritma Light Stemming," *MATRIK : Jurnal Manajemen, Teknik Informatika dan Rekayasa Komputer*, vol. 19, no. 1, pp. 109–118, Nov. 2019, doi: 10.30812/matrik.v19i1.509.
- [6] D. Vrandečić, "Building a multilingual Wikipedia," *Commun ACM*, vol. 64, no. 4, pp. 38–41, Apr. 2021, doi: 10.1145/3425778.
- [7] F. Lemmerich, D. Sáez-Trumper, R. West, and L. Zia, "Why the world reads Wikipedia: Beyond English speakers," in *WSDM 2019 - Proceedings of the 12th ACM International Conference on Web Search and Data Mining*, Association for Computing Machinery, Inc, Jan. 2019, pp. 618–626. doi: 10.1145/3289600.3291021.
- [8] C. Ramdani, D. M. Kusumawardani, and F. I. Ali, "PERANCANGAN E-NOTULEN MENGADOPSI MODEL PENGEMBANGAN PROTOTYPING DAN JOINT APPLICATION DEVELOPMENT," *IJIS - Indonesian Journal On Information System*, vol. 5, no. 2, p. 90, Sep. 2020, doi: 10.36549/ijis.v5i2.103.
- [9] A. F. Sallaby and I. Kanedi, "Perancangan Sistem Informasi Jadwal Dokter Menggunakan Framework Codeigniter," *JURNAL MEDIA INFOTAMA*, vol. 16, no. 1, Aug. 2020, doi: 10.37676/jmi.v16i1.1121.
- [10] R. F. Tias, M. N. Hamidah, A. Arizal, and F. Setyatama, "Smart School Management System of Presence Monitoring Teacher as A Realtime with Rad (Rapid Application Development) Method at Khadijah High School Surabaya," *JEECS (Journal of Electrical Engineering and Computer Sciences)*, vol. 6, no. 1, pp. 999–1004, Jun. 2021, doi: 10.54732/jeeecs.v6i1.190.
- [11] A. Mubarak, "RANCANG BANGUN APLIKASI WEB SEKOLAH MENGGUNAKAN UML (UNIFIED MODELING LANGUAGE) DAN BAHASA PEMROGRAMAN PHP (PHP HYPERTEXT PREPROCESSOR) BERORIENTASI OBJEK," *Jurnal Informatika dan Komputer* Ternate, vol. 02, no. 1, 2019.
- [12] A. K. Rahmatika, F. Pradana, and F. Abdurrachman Bachtiar, "Pengembangan Sistem Pembelajaran HTML dan CSS dengan Konsep Gamification berbasis Web," 2020. Accessed: Aug. 01, 2023. [Online]. Available: <https://j-ptiik.ub.ac.id/index.php/j-ptiik/article/view/7738>
- [13] G. Gunadi, "Impelementasi Metode Rapid Application Development Pada Rancang Bangun Sistem Informasi Berbasis Web dengan Framework W3.CSS," *Informatik : Jurnal Ilmu Komputer*, vol. 17, no. 3, p. 246, Dec. 2021, doi: 10.52958/iftk.v17i3.3891.
- [14] A. Wirfs-Brock and B. Eich, "JavaScript: The first 20 years," *Proceedings of the ACM on Programming Languages*, vol. 4, no. HOPL, Jun. 2020, doi: 10.1145/3386327.
- [15] B. Rawat and S. Purnama, "MySQL Database Management System (DBMS) On FTP Site LAPAN Bandung," *International Journal of Cyber and IT Service Management (IJCITSM)*, vol. 1, no. 2, pp. 173–179, 2021, doi: 10.34306/ijcitsm.v1i1.47.
- [16] R. F. Ramadhan and R. Mukhaiyar, "Penggunaan Database Mysql dengan Interface PhpMyAdmin sebagai Pengontrolan Smarhome Berbasis Raspberry Pi," *JTEIN: Jurnal Teknik Elektro Indonesia*, vol. 1, no. 2, pp. 129–134, Nov. 2020, doi: 10.24036/jtein.v1i2.55.
- [17] A. Sahi, "Aplikasi Test Potensi Akademik Seleksi Saringan Masuk LP3I Berbasis Web Online menggunakan Framework Codeigniter," *TEMATIK*, vol. 7, no. 1, pp. 120–129, Jun. 2020, doi: 10.38204/tematik.v7i1.386.
- [18] A. Alip, S. Kosasi, I. D. A. E. Yuliani, G. Syarifudin, and D. David, "Implementasi Arsitektur Model View Controller Pada Website Toko Online," *Jurnal Bumigora Information Technology (BITE)*, vol. 3, no. 2, pp. 135–150, Jan. 2022, doi: 10.30812/bite.v3i2.1566.
- [19] L. Setiyani, "PENGUJIAN SISTEM INFORMASI INVENTORY PADA PERUSAHAAN DISTRIBUTOR FARMASI MENGGUNAKAN METODE BLACK BOX TESTING," *Techno Xplore : Jurnal Ilmu Komputer dan Teknologi Informasi*, vol. 4, no. 1, pp. 1–9, Apr. 2019, doi: 10.36805/technoexplo.v4i1.539.
- [20] M. Larassati, A. Latukolan, A. Arwan, and M. T. Ananta, "Pengembangan Sistem Pemetaan Otomatis Entity Relationship Diagram Ke Dalam Database," Apr. 2019. Accessed: Aug. 01, 2023. [Online]. Available: <https://j-ptiik.ub.ac.id/index.php/j-ptiik/article/view/5117>