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Building an Effective Quran Learning System with Prototyping Model

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Abstract

This study presents the development of an Android-based Qur'anic learning application using the Sahlun method, which combines the theoretical structure of the Ummi method with the oral articulation practices of Riyadhatul Lisan. To ensure user-centered design, the application was developed using the prototyping model, allowing iterative refinement based on user feedback throughout the development cycle. The application aims to address the pedagogical gap often found in Qur'anic Education Centers (TPA), where theoretical tajwid instruction lacks integration with practical articulation training. The system was evaluated using the User Acceptance Testing (UAT) method involving Sahlun method practitioners. The results demonstrate that the application significantly improves the efficiency of reading record-keeping, supports systematic monitoring of student progress, and is perceived as user-friendly and contextually appropriate. These findings validate the effectiveness of the prototyping approach in developing digital Islamic educational tools and underscore the potential of the Sahlun method's digitalization to support structured, modern Qur'anic instruction.

Keywords:
Sahlun method, Qur`an Learning, Prototyping, Android Application, Al-Qur`an Education Center

1. Introduction

The Quran is the central religious text in Islam and holds a fundamental place in the lives of Muslims. Mastery of Quranic reading, recitation, and understanding is considered essential, as it serves as a guide for daily life and spiritual development. However, numerous studies have highlighted challenges in the effectiveness of traditional Quran learning methods. These challenges include limited teacher availability, insufficient learning resources, and a lack of engaging instructional models, particularly for younger generations who are more inclined toward technology-based learning tools. In this context, digital learning systems have emerged as a promising solution to support and enhance the process of Quran education, offering greater accessibility and flexibility for learners of various backgrounds [1][2].

The rapid advancement of educational technology has led to the development of innovative learning systems that integrate pedagogical strategies with software engineering models. Among these approaches, the prototyping model has gained attention for its ability to quickly deliver functional learning applications that can be refined based on user feedback. This iterative design process ensures that the developed system is closely aligned with learners' needs and instructional objectives. For Quran learning, this is particularly significant because different user groups, such as children, adults, and

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teachers, may require tailored features that accommodate various learning styles and proficiency levels [3][4].

Several previous studies have successfully applied prototyping in the development of educational applications, demonstrating improvements in usability and learning outcomes. For example, mobile-based Quran learning platforms have been shown to enhance student engagement and retention by integrating interactive features, multimedia resources, and real-time feedback mechanisms. These findings indicate that the prototyping model not only accelerates the development process but also allows developers to continuously incorporate pedagogical enhancements. Moreover, such systems are better equipped to handle dynamic requirements and evolving user expectations, ensuring long-term relevance in the field of Islamic education [5][6].

Despite these advancements, there remains a need to design Quran learning systems that prioritize user-centered design while addressing pedagogical effectiveness. This research aims to build an effective Quran learning system using the prototyping model to bridge gaps found in traditional learning approaches. By focusing on iterative user feedback, the resulting system is expected to provide a comprehensive learning experience that combines ease of use, accessibility, and high educational value. The system is envisioned to benefit various stakeholders, including students, educators, and Islamic institutions, ultimately contributing to the broader goal of improving Quranic literacy in the digital era [7][8].

Learning the Qur'an presents many challenges in the form of an imbalance between theoretical and practical approaches. This imbalance has the potential to hinder comprehensive mastery of reading the Qur'an. To address this issue, the Sahlun method focuses on oral practice and the articulation of letters. This integrated approach enables students to understand the rules of recitation while simultaneously practicing correct pronunciation. However, in practice, Quranic education still faces challenges such as limited learning materials, manual record-keeping, and the lack of digital systems to support effective teaching management by TPA instructors [3].

This study aims to develop an application based on the Sahlun method with the Prototyping Model in the learning process of the Qur'an. In addition to simplifying the process of recording tahsin and monitoring students' progress, this application is also developed to address the challenge of high printing costs for learning materials. The prototyping model was chosen because it enables an iterative development process based on user feedback, which is crucial in the context of digital transformation in Al-Qur'an education at TPA.

2. Related Works

Numerous studies have explored traditional Qur'anic learning methods such as Ummi, Iqro', and Riyadhatul Lisan. The Ummi method is praised for its systematic approach to tajweed instruction, emphasizing structured theory and pronunciation rules that are easy to follow for both teachers and students. Meanwhile, Riyadhatul Lisan centers on articulation training, particularly the makhraj of hijaiyah letters, providing intensive practice-based learning. On the other hand, the Iqro' method prioritizes simplicity, enabling young learners to quickly recognize and pronounce hijaiyah letters through a sequential and accessible module. Although these methods are widely implemented in offline settings, they present challenges in scalability, progress monitoring, and interactive assessment when delivered through conventional instruction [1][2][7].

To address these limitations, researchers have begun integrating mobile learning systems into Qur'anic education using models such as Rapid Application Development (RAD) and Prototyping. Novita [8] and Izzuddin et al. [9] implemented the prototyping model

to build Android-based tajweed applications, facilitating iterative development that involved user feedback and usability testing. These approaches allowed developers to refine the learning interface and interaction design in line with learner needs. The prototyping model in particular offers significant benefits in educational system development by enabling quick visualization of features and early detection of usability issues, thereby promoting responsive and learner-centered application design.

A growing body of research also highlights the benefits of mobile applications in improving learning accessibility and outcomes in Qur'anic studies. Umar and Tilli [10] demonstrated how mobile learning platforms increased learner engagement, flexibility, and retention, especially among students in remote or underserved areas. Nasution et al. [11], for instance, designed a tahsin application using the Dynamic Time Warping (DTW) method to assess the similarity of recitations to standard references. This integration of automatic feedback mechanisms illustrates how digital tools can complement traditional Qur'anic learning methods by offering precise and immediate pronunciation evaluation.

Furthermore, studies have emphasized the role of UI/UX optimization in enhancing mobile Qur'anic learning. Fajarini and Haryono [13] incorporated the halaqah method into a tahfidz application, using Importance Performance Analysis (IPA) to evaluate the balance between user expectations and perceived functionality. Similarly, research by Iftikhar and Hayat [12] documented how Android Qur'an applications revolutionized user experience by introducing interactive features, gamified assessments, and cloud-based progress tracking. However, these applications often lacked alignment with structured pedagogical frameworks, particularly those combining both theoretical and practical elements of tajweed and recitation.

To fill this gap, recent studies have introduced the Sahlun method, which synthesizes the pedagogical strengths of the Ummi and Riyadhatul Lisan methods into six systematic volumes. The Sahlun approach presents a well-balanced curriculum that combines tajweed theory, articulation practice, and contextual reading, offering a more comprehensive alternative to existing methods. Despite its structured nature, no prior research has attempted to digitize this method into a mobile application using prototyping. The development of such a system would allow real-time feedback between teachers and students, and iterative refinement of features, ensuring that the system effectively supports classroom teaching while being adaptable to student needs.

This research proposes a novel contribution by designing an Android-based Qur'anic learning application that implements the Sahlun method using a prototyping model. Through iterative development cycles, feedback from teachers and learners can continuously refine the system. This approach not only enhances the accuracy and usability of the digital platform but also supports the integration of structured pedagogical content into a mobile learning environment. Similar efforts were seen in Affandi et al.'s thematic Qur'an learning model [14], but the current study distinguishes itself by explicitly aligning development with the Sahlun method, thereby contributing both to the field of Islamic education and to the methodological use of prototyping in religious learning technologies.

3. Proposed Method

Proposed Method The development method used in this research is the prototyping model, which is appropriate when user requirements are not fully defined at the outset and require continuous feedback-based iteration [15]. This model consists of five main stages, namely: communication, rapid planning, modeling, prototyping, and user evaluation. The Sahlun method was chosen because it combines theoretical and practical approaches in a balanced manner, which is a fundamental requirement in Al-Qur'an learning. The prototyping model supports flexibility in designing a system that suits the needs of TPA teachers, as it allows for gradual development based on user input. This approach has also

been used in other Android-based application development research in the context of plant disease detection systems using [16]. In the Sahlun method, the success of students in mastering the material is determined through a practical reading test. Students are allowed a maximum of three errors per page. If more than three errors are found, the student must repeat the material or page. This rule forms the basis for the digital tahsin recording feature designed to help teachers conduct detailed and accurate evaluations.

3.1. Prototyping Model

The Prototyping Model is a software development methodology focused on quickly building a working model (prototype) of a system to understand its requirements, refine user needs, and develop an effective final system. While it is generally considered a process model rather than a mathematically formalized method, we can express core ideas of the prototyping process mathematically using function mappings and iterative refinement logic that suits Quran Learning Services.

Mathematical Formulation of the Prototyping Method
Let the prototype development process be defined as a sequence of approximations:
1. Initial Requirements Function:
Let $R: U \rightarrow S$ be a mapping from user needs U to an initial system specification S:

$$S_0 = R(U) \quad (1)$$

Where:

- U = set of user requirements or learning goals in the Quran learning service
- S_0 = initial system specification

2. Prototype Development Function:
A prototype P_i is built based on the current specification S_i:

$$P_i = D(S_i) \quad (2)$$

Where D is the design function creating a working model from the specification.

3. User Evaluation and Feedback:
User interaction with prototype P_i generates feedback F_i:

$$F_i = E(P_i, U) \quad (3)$$

Where:

- E is the evaluation function measuring how well the prototype meets user needs

4. Iterative Refinement:
Refine the specification based on feedback:

$$S_{i+1} = S_i + \Delta F_i \quad (4)$$

Where:

- ΔF_i represents updates or corrections based on feedback

Repeat steps 2–4 until convergence:

$$\lim_{i \rightarrow n} P_i \rightarrow P^*$$

Where P^* is the final prototype that becomes the basis for full system development.

The mathematical formulation of the prototyping method models the iterative nature of software development where user feedback continuously refines the system. It begins with a function R that maps user requirements U to an initial system specification S_0. This represents the understanding of user needs at the start of the project. The design function D then transforms this specification into a prototype P_i, a working version of the system that embodies the initial design assumptions. After deployment or testing, users interact with the prototype, and an evaluation function E generates feedback F_i that reflects the gaps between the users' expectations and the prototype's performance.

This feedback F_i is then used to iteratively update the system specification through $S_{i+1} = S_i + \Delta F_i$, where ΔF_i denotes the improvements suggested by users. This process repeats through successive versions $P_1, P_2, \ldots, P_n$, each closer to the users' actual needs. The model converges when further feedback yields no significant changes, achieving a final prototype P^*. In the context of the Quran Learning application, this cycle allows the development of educational tools tailored to Quranic learning by incorporating user-driven improvements at each stage to ensure pedagogical effectiveness, cultural appropriateness, and ease of use.

3.2 UI Design with Prototyping

In this study, we construct the design of the app's appearance, specifically the login page and dashboard, to ensure an intuitive flow of use. The modeling or quick design stage aims to produce a visual representation of the application. The wireframe design is based on the structure from the previous stage. Elements such as buttons, input fields, and main navigation are visually depicted. This stage is the process of building the initial version of the application based on the design results. The development team implemented the interface, main feature logic, and database connection using Firebase. The prototype is functionally tested to ensure each feature runs as expected, even though it is not completely perfect. The prototype is then ready to be validated by users in the next stage. Fig. 1 depicts the UI of the Quran learning application with a prototyping model.

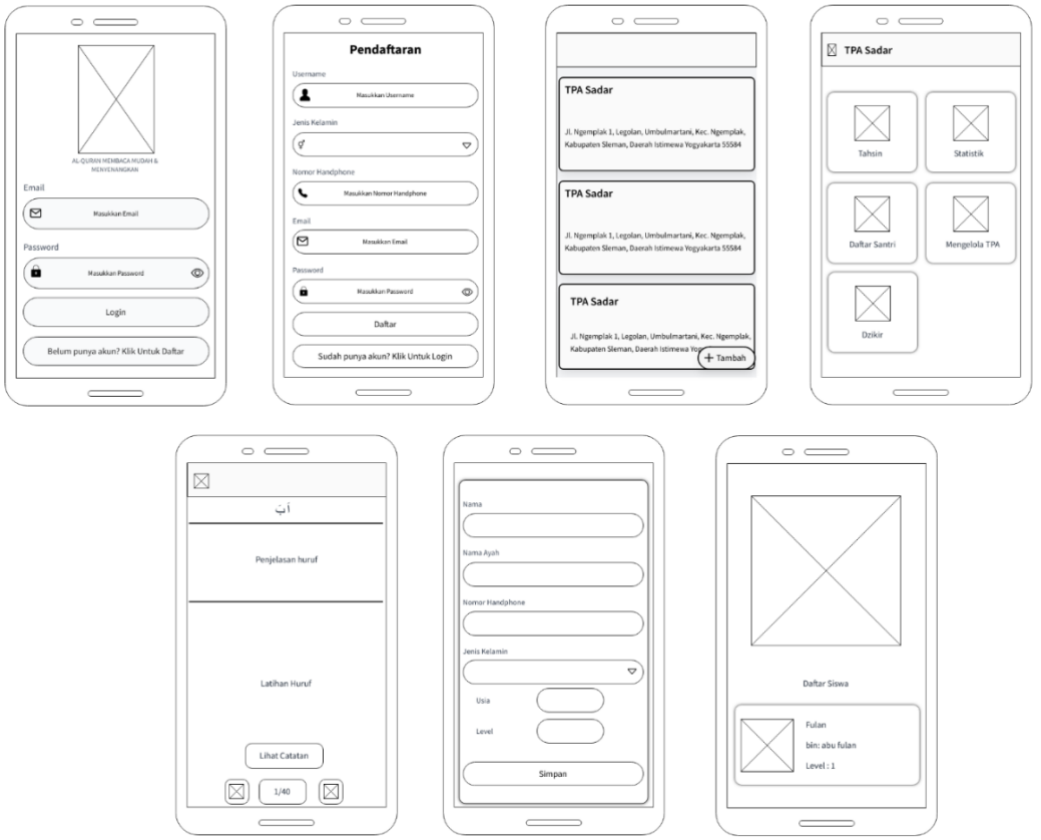

Fig. 1 User Interface of Quran learning application with prototyping model.

In this study, we adopt the User Acceptance Testing (UAT) approach to provide feedback regarding ease of use, relevance of features to the Sahlun method, and interface appearance. This feedback becomes the basis for iterating improvements or developing further versions [17]. In the context of the building Quran learning system with prototyping model, the User Acceptance Testing (UAT**)** approach can be mathematically formulated to measure user satisfaction**,** usability**,** and system effectiveness using quantitative metrics.

1. UAT Scoring Formula

Let:

- U_i = score given by the i^{th} user
- n = total number of users/respondents
- S = total maximum score per user (e.g., if there are 5 questions on a 5-point Likert scale, then $S = 25$)
- T = total score obtained from all users

Then:

$$T = \sum_{i=1}^{n} U_i \tag{5}$$

The User Acceptance Rate (UAR) in percentage is calculated as:

$$UAR = \left(\frac{T}{n \times S}\right) \times 100\% \tag{6}$$

2. Acceptance Criteria

Define a threshold θ (e.g., $\theta = 75\%$) such that:

If $UAR \geq \theta \Rightarrow$ System is accepted

If $UAR<\theta \Rightarrow$ System needs improvement

3. Dimension-Based Evaluation

If the questionnaire is divided into multiple aspects $A = \{a_1, a_2, \ldots, a_k\}$ such as:

- Usability
- Efficiency
- Satisfaction
- Learnability

Then for each aspect a_j:

$$UAR_{a_j} = \left(\frac{T_{a_j}}{n \times S_{a_j}}\right) \times 100\% \tag{7}$$

Where:

- T_{a_j} = total score of aspect j
- S_{a_j} = maximum possible score for aspect j

This mathematical formulation helps quantify how well the users accept the application developed using the prototyping model. High UAR values across all aspects indicate strong user acceptance and system readiness for deployment.

4. Experimental Setup

Application testing was conducted to evaluate the effectiveness and ease of use of the main features by the main user of the system, namely Ustadz Slamet Riyanto. He is the teacher and designer of the Sahlun method, and currently the only practitioner who actively applies the method in Qur'anic learning at the Qur'anic Education Center. As the Sahlun method is still relatively new and has not been widely adopted, this single participation was considered representative in the context of initial validation. This approach is in line with the expert-based evaluation strategy commonly used in the early stages of developing systems based on new methods.

The evaluation was conducted using the User Acceptance Testing (UAT) approach, where respondents were asked to try the main features of the application, such as login and registration, management of student data, recording digital tahsin per letter, visualization of reading statistics, and access to daily dhikr. The trial was conducted directly in the context of real use at the Qur'anic Education Center. Data were obtained through

direct observation and semi-structured interviews, then analyzed descriptively to assess aspects of functionality, user interface, and system suitability for the structure of the Sahlun method. The test results became the basis for evaluating the feasibility of the system and proposing further development. This approach is consistent with post-pandemic digital learning adaptations in Islamic schools [18].

5. Results and Analysis

In this part, we present the implementation of the user interface of the Android application with a prototyping model. This interface is designed to be intuitive, easy to use, and in accordance with the needs of Qur'anic Education Park teachers. The implementation includes login features, student data management, digital tahsin pages, reading statistics, and dhikr features. Fig. *2* depicts the implementation of UI for the Quran learning application with a prototyping model

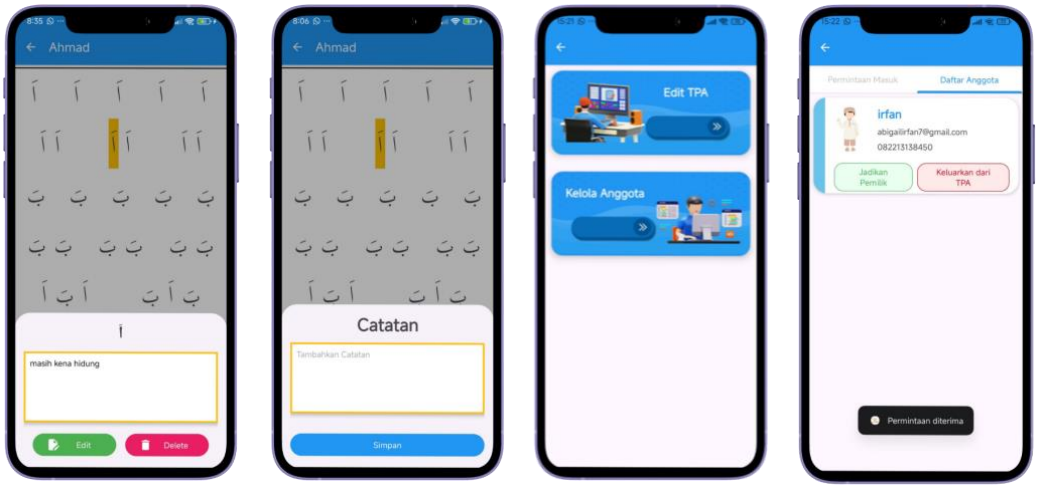

Fig. 2 Implementation of UI for Quran learning application with prototyping model.

At the evaluation stage, the system showed that all the main features are feasible to use in the real context of learning the Qur'an in a Qur`anic Education Center. The User Acceptance Testing (UAT) process showed that the application interface is intuitive and easy to operate, even by users with limited technological backgrounds. Key features such as tahsin note-taking proved to be helpful in the learning process as it allows specific documentation of reading errors per letter, following the volume structure of the Sahlun method. The statistics of students' reading progress are also displayed in an informative graphic visualization, making it easier for teachers to monitor target achievement and identify students who need further attention.

In this paper, we conducted the User Acceptance Testing (UAT) method with seven main features in the application. Respondents were asked to provide feedback regarding ease of use, functionality, and suitability of features to the needs of teaching Al-Qur'an based on the Sahlun method. The evaluation results are summarized in Table 1 below.

Table 1. User Acceptance Testing (UAT) Evaluation Results

No	Tested Features	Interaction Description	User Feedback	Evaluation Status
1	Login & Registration	Authentication via email and password	Easy process, simple and quick to understand interface	Usable
2	Creation & Joining of Qur'anic Education Park	Creating or joining a Qur'anic Education Institution	Flexible mechanism, clear navigation	Usable
3	Dashboard	Navigate to the main features of the app	Feature structure is clear and easy to access	Usable
4	Tahsin Recording	Input reading error records per letter	As per Sahlun's book, supporting practical tajweed teaching	Usable
5	Student Reading Statistics	Visualization of students' reading progress in graphs	Visualizations are informative and easy to understand	Usable
6	Student Data Management	Add, edit, delete student data in real-time	Responsive and efficient interaction	Usable
7	Dhikr Access	Link to morning and evening dhikr	Helpful for daily worship routines	Usable

Testing shows that this application is very helpful in the process of learning the Qur'an because it can replace the manual system that has been used so far. The Tahsin note feature allows recording specific reading errors per letter, according to the needs of teaching based on the Sahlun method. In addition, the student development statistics are very helpful in monitoring the achievement of reading targets and identifying students who need further attention. This is in line with the initiative to improve teacher quality digitally in Islamic schools throughout the city of Padangsidimpuan [19].

6. Conclusion

This study successfully developed an application model based on the Sahlun method with prototyping the learning process of the Qur'an. This application combines a systematic tajweed theory approach and the practice of pronunciation of letter makhraj, which is the core of the Sahlun method, through digital features such as tahsin recording per letter, student data management, reading progress statistics, and access to daily dhikr. The evaluation results using the User Acceptance Testing (UAT) approach show that this application is considered suitable for use by practitioners of the Sahlun method. The

intuitive and responsive interface also supports the work efficiency of Qur'anic Education Center teachers in the process of evaluating student reading. The integration of modern curricula with digital tools is essential to ensure sustainable Islamic education in this era [20].

This research makes a significant contribution to the field of Islamic educational technology, particularly in the digitalization of innovative Qur'an learning methods. Going forward, further development can be directed toward expanding the scope of the application to cover all volumes of the Sahlun method, including volume 6 as the final level. In addition, the system will be developed to support automatic progress reports that can be accessed directly by parents of students. Plans also include adding specialized roles for students and parents within the system, ensuring that each user has an interface and access rights tailored to their needs. Audio-based pronunciation features will also be integrated, allowing students to hear correct recitation examples as part of their self-study exercises. All these further developments will be tested across various Quranic schools to assess the system's effectiveness and broader applicability.

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