

A Conceptual Framework for Integrating Design Thinking and Technology Acceptance Models in Islamic Quran Memorization Mobile Applications

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ABSTRACT

The integration of digital technologies, particularly mobile applications for Quran memorization (Tahfiz), has significantly influenced religious education in Indonesia. Despite the growing availability of such applications, many existing platforms still emphasize technical functions and generic engagement features while insufficiently addressing learners' spiritual experience, pedagogical needs, and trust in Quranic content. This study proposes a conceptual framework that integrates Design Thinking (DT) with the Technology Acceptance Model (TAM), the Unified Theory of Acceptance and Use of Technology (UTAUT), and the Technology Acceptance Model in Islamic Education (TAMISE). The framework argues that the DT stages of empathizing, defining, ideating, prototyping, and testing can strengthen acceptance factors, including perceived usefulness, perceived ease of use, Islamic education compatibility, trust, and digital self-efficacy. These factors are expected to influence behavioral intention and actual system use, which in turn contribute to Enhanced Tahfiz Learning Outcomes (ETLO). ETLO is operationalized through measurable indicators such as memorization retention, recitation accuracy, revision consistency, learner engagement duration, and teacher-verified progress. The paper further proposes empirical validation through expert panel review, Delphi or Analytic Hierarchy Process (AHP) construct prioritization, pilot prototyping, structural equation modeling, and mixed-method studies involving students, teachers, and religious scholars. The framework provides theoretically grounded and practically actionable guidance for designing Quran memorization applications that are usable, trustworthy, culturally appropriate, and aligned with Islamic pedagogical values.

Keywords: Design Thinking, Technology Acceptance, Quran Memorization Application, Tahfiz Learning, Educational Technology.

INTRODUCTION

Digital transformation has reshaped education, including Islamic studies and Tahfiz Quran learning. In Indonesia and Malaysia, Tahfiz education increasingly uses mobile applications to support recitation practice, memorization monitoring, audio modelling, tafsir access, and learner engagement (N. Ibrahim et al., 2024; Purbohadi et al., 2019). However, the pedagogical value of these applications depends not only on the availability of digital features but also on how well the design reflects users' learning routines, cultural context, religious expectations, and institutional readiness. Design Thinking provides a structured human-centered process for understanding learner and teacher needs, generating context-sensitive solutions, and refining prototypes through feedback (Plattner et al., 2011; Razzouk & Shute, 2012). In the Tahfiz context, this approach shifts development from merely digitizing Quranic content toward creating spiritually meaningful and educationally effective learning experiences. Therefore, a framework that combines Design Thinking with technology acceptance constructs is needed to explain both how Tahfiz applications should be designed and why users may adopt them sustainably.

BACKGROUND

Design Thinking: Principles and Application in Software Development Core Principles

Design Thinking (DT) is a nonlinear and iterative methodology that enables designers to understand users, challenge assumptions, redefine problems, and develop solutions through systematic prototyping and testing (Plattner et al., 2011; Razzouk & Shute, 2012). It emphasizes empathy, collaborative inquiry, creativity, experimentation, and evidence-based refinement. In software and educational technology development, DT helps balance user desirability, technical feasibility, and institutional viability (Olivares Ugarte & Bengtsson, 2024).

The iterative nature of Design Thinking is crucial for Tahfiz applications because memorization practices involve complex interactions among learners, teachers, parents, religious authorities, and institutional routines. Iterative prototyping can reduce the risk of static designs by allowing learners and teachers to test features such as revision schedules, audio modelling, progress dashboards, and pronunciation feedback before large-scale implementation. The empathy and testing stages are particularly important for identifying digital literacy levels, spiritual sensitivities, and local pedagogical preferences in Tahfiz schools.

Technology Acceptance Models in Educational and Religious Contexts Overview of TAM, UTAUT, and Their Extensions (e.g., TAMISE)

Technology acceptance research has developed since the 1980s through models such as TAM and UTAUT. TAM explains adoption through perceived usefulness and perceived ease of use as central determinants of behavioral intention (Davis, 1989). UTAUT extends this perspective by incorporating performance expectancy, effort expectancy, social influence, and facilitating conditions (Venkatesh et al., 2003). These models remain useful for educational technology studies, but they require contextual adaptation for religious learning environments where authenticity, trust, and compatibility with Islamic values are central to adoption.

TAMISE enhances TAM by adding Perceived Islamic Education Compatibility and Digital Self-Efficacy (Abubakari & Zakaria, 2023). TAMISE shows that PU, PEOU, Digital Self-Efficacy, Islamic education compatibility, and Behavioral Intention shape digital learning acceptance in Islamic education (Abubakari & Zakaria, 2023). Evidence from Muslim communities in Denmark shows that ease of use and self-efficacy influence technological attitudes (Yusriani & Patiro, 2024). The evolution from the TAM to the TAMISE demonstrates the need for context-specific models in religious settings (Abubakari & Zakaria, 2023). For mobile apps in Tahfiz education, the design must incorporate Islamic educational needs, ensuring that technology aligns with religious values.

Key Determinants of Technology Acceptance

In the proposed framework, the acceptance constructs are retained only where they add distinct explanatory value and can be translated into design requirements. The constructs are defined as follows:

1. *Perceived Usefulness (PU)*: The extent to which users believe that the application improves Tahfiz performance, including memorization efficiency, revision quality, progress monitoring, and teacher feedback (Davis, 1989; M. A. Ibrahim et al., 2024).
2. *Perceived Ease of Use (PEOU)*: The extent to which users perceive the application as easy to learn, navigate, and integrate into daily memorization routines with minimal cognitive effort (Davis, 1989).
3. *Perceived Islamic Education Compatibility (PIEC)*: This evaluates the app's alignment with Islamic values, ethical standards, and Tahfiz pedagogical principles (Abubakari & Zakaria, 2023).
4. *Trust (TR)*: Especially in Islamic contexts, where it is crucial to ensure the precision, authenticity (Lee et al., 2025), and religious legitimacy of materials, such as Quranic verses and their interpretations (Yusoff et al., 2024).
5. *Digital Self-Efficacy (DSE)*: Refers to users' belief in their ability to use digital tools well, which affects their willingness to learn technology (Abubakari & Zakaria, 2023).

The relationship between PU, PEOU, and Trust is vital in religious applications. Design Thinking improves usability, while trust in religious content remains fundamental (Yusoff et al., 2024). The empathy phase should address user concerns about religious credibility to provide an effective solution.

CHALLENGES

Key Themes: Learning and Memorization, Text Analysis and Information Retrieval, and User Experience and Engagement

A comprehensive analysis of current Quran mobile apps identified three main themes that define their design and functionality (Isa et al., 2023):

1. *Learning and Memorization*: This theme includes features of learning to read, write, and memorize the Quran. It has tools to check pronunciation, fit different learning styles (visual, aural, read/write, and kinesthetic VARK), and find similar verses to avoid memorization mistakes (Isa et al., 2023).
2. *Text Analysis and Information Retrieval*: This theme examines how Quranic texts are used in mobile apps, including features such as finding verse details (juz number, surah name, verse number, meaning), bilingual translations, bookmarking, sharing on social media, and advanced features such as Quran verification and speech recognition (Isa et al., 2023).
3. *User Experience and Engagement*: This theme explores how users interact with Quranic mobile applications. This highlights the importance of user-friendly interfaces, especially for specific user groups, such as senior citizens and children with autism. It examines the impact of these applications on user performance, satisfaction, and behavior in Quranic studies (Isa et al., 2023).

This highlights the significance of Design Thinking, which prioritizes user experience in developing solutions that are both effective and widely accepted.

Identified Challenges: Lack of Innovative Approaches, Limited User-Friendliness, Reliability Concerns, Traditional Teaching Methods, and Local Context Neglect

Although a wide array of Quran mobile apps is available, numerous key obstacles remain in their creation and use, as detailed in Table 1.

Table 1. Identified Challenges in the Development and Adoption of Quran Mobile Applications for Tahfiz

Challenge	Description	Source	Implications
Lack of Innovative Approaches	Most applications emphasize basic technological features without exploring creative and engaging methods for Quran memorization and understanding.	(Isa et al., 2023)	This leads to shallow user engagement and limited educational impact. This underscores the need for novel, immersive design frameworks such as Design Thinking.
Limited User-Friendliness	Applications often fail to provide a seamless and intuitive experience, making it difficult for diverse user groups (e.g., young learners and teachers) to navigate.	(Isa et al., 2023)	This reduces usability and learning efficiency. The design must prioritize diverse user needs, especially in the context of local Tahfiz schools.
Reliability Concerns	Issues surrounding the authenticity and classification of Quranic content in apps raise critical concerns regarding religious accuracy.	(Djazilan et al., 2024; M. A. Ibrahim et al., 2024; Isa et al., 2023)	Strict verification and ethical design are essential when integrating AI to ensure user trust and religious compliance.

Traditional Teaching Methods	Continued reliance on rote methods (e.g., oral repetition and copying text) contributes to student disengagement.	(M. A. Ibrahim et al., 2024; Isa et al., 2023)	This highlights the need to blend traditional pedagogy with technology-based approaches to improve attention, retention, and motivation.
Local Context Neglect	Apps often lack contextual adaptation for local Tahfiz environments, such as language, culture, and readiness of teachers	(Ariffin et al., 2022, 2024)	Calls for localization of content and features must be culturally sensitive and pedagogically appropriate.

Ethical Considerations in Islamic App Development

Ethical considerations are central to Islamic mobile applications, especially those with Qur'anic content. These apps must ensure credibility and accuracy to maintain religious integrity (Yusoff et al., 2024). Developers must uphold Islamic work ethics, guided by Taqwa (God-consciousness), Ihsan (excellence), Al-Birr (righteousness), and Masuliyyah (responsibility). These principles stem from Al-Ghazali's model and Surah Al-Fatihah teachings (Yusoff et al., 2024). The integration of AI into Islamic education has raised ethical concerns regarding its alignment with Islamic principles. Solutions require AI customization and ethical governance (Djazilan et al., 2024). Within Design Thinking, phases such as "Define" and "Empathize" must incorporate religious sensitivities to ensure that innovations are user-centered and spiritually respectful within the Muslim community.

PROPOSED CONCEPTUAL FRAMEWORK

Rationale for Integrating Design Thinking and Technology Acceptance Models

Current Islamic Quran apps for Tahfiz lack user engagement and memorization aids, as developers prioritize technology over user needs (Isa et al., 2023). Traditional Tahfiz methods, while valuable, often seem dull and reduce student motivation (M. A. Ibrahim et al., 2024).

Design Thinking (DT) offers a human-centered approach for identifying user needs and developing context-sensitive solutions through empathy, ideation, prototyping, and testing (Plattner et al., 2011; Razzouk & Shute, 2012). However, an effective design does not automatically ensure adoption. Technology acceptance models such as TAM and UTAUT explain how perceived usefulness, ease of use, social influence, and facilitating conditions shape users' intention and behavior (Davis, 1989; Venkatesh et al., 2003).

In religious contexts, the Technology Acceptance Model in Islamic Education (TAMISE) identifies "Perceived Islamic Education Compatibility" and "Trust" as crucial adoption factors (Abubakari & Zakaria, 2023). Merging Design Thinking with Technology Acceptance Models creates a framework for user-centered Tahfiz applications. Design Thinking fosters responsive solutions, whereas acceptance models ensure alignment with user needs. This integration forms a process in which user feedback informs acceptance constructs, guiding design iterations to enhance Tahfiz learning. The core constructs of TAM's relationship with DTP are detailed in Table 2.

Table 2. Core Construct of TAM Interrelationship with DTP

No.	Construct	Definition	Interrelationship with Design Thinking Process (DTP)
1.	Perceived Usefulness (PU)	The extent to which Tahfiz students and teachers believe that the app enhances Quran memorization, comprehension, and learning efficiency. It includes progress tracking, mistake detection, and the creation of personalized learning paths.	Empathize and Ideate Phases: Identify user needs to ensure relevant features. Test Phase: Iteratively validate and refine features for practical use based on real user feedback.

2.	Perceived Ease of Use (PEOU)	The degree to which users perceive the app as easy to learn, intuitive, and effortless to use. It includes user-friendly interfaces, easy navigation, and low cognitive load.	Prototype and Test Phases: Focus on interface simplicity and usability. Continuous user testing ensures ease of use by providing iterative feedback.
3.	Perceived Islamic Education Compatibility (PIEC)	Degree to which the app aligns with Islamic values, Tahfiz pedagogy, and religious ethics. It includes Tajwid adherence, content authenticity, and proper religious representation	Empathize and Define Phases: Frame design around Islamic ethical requirements and pedagogy. Test Phase: Validation of content by religious scholars to ensure compliance and appropriateness.
4.	Trust (TR)	Confidence in the app's reliability, security, and content authenticity. This is especially important for the accuracy of Quranic verses and tafsir.	Define and Prototype Phases: Ensure that the content is authentic and verifiable. Ideate and Test Phases: Address privacy/security concerns, reinforce transparency, and incorporate ethical standards to foster trust
5.	Digital Self-Efficacy (DSE)	Belief in one's capability to effectively use the app for memorization and learning.	Empathize Phase: Understanding the digital literacy levels of users. Design tailored for usability: High PEOU positively reinforces user confidence.
6.	Behavioral Intention to Use (BIU)	Likelihood that users will regularly use the app for Quran learning.	Derived Construct: BIU is influenced by PU, PEOU, PIEC, TR, and DSE. A well-executed DTP indirectly contributes to a stronger BIU through its positive impact on these influencing factors.
7.	Actual System Use (ASU)	The real-world, observable usage of the app by Tahfiz users for Quran study.	Driven by BIU: Reflects whether intention translates into actual behavior. Consistent user-centered iterations in DTP increase the likelihood of adoption and sustained usage.
8.	Enhanced Tahfiz Learning Outcomes (ETLO)	Observable improvement in Quran memorization performance and learning engagement, including retention of memorized verses, recitation accuracy, revision consistency, engagement duration, and teacher-verified progress.	Driven by ASU and verified through learning analytics and teacher assessment. DT-informed features should be evaluated against measurable Tahfiz indicators rather than general satisfaction alone.

The framework shows that effective, user-centered Design Thinking enhances acceptance factors, leading to app use and improved Tahfiz outcomes. Success is defined as a measurable educational impact, reinforcing human-centered and outcome-driven development. Table 3 presents proposed conceptual framework structure.

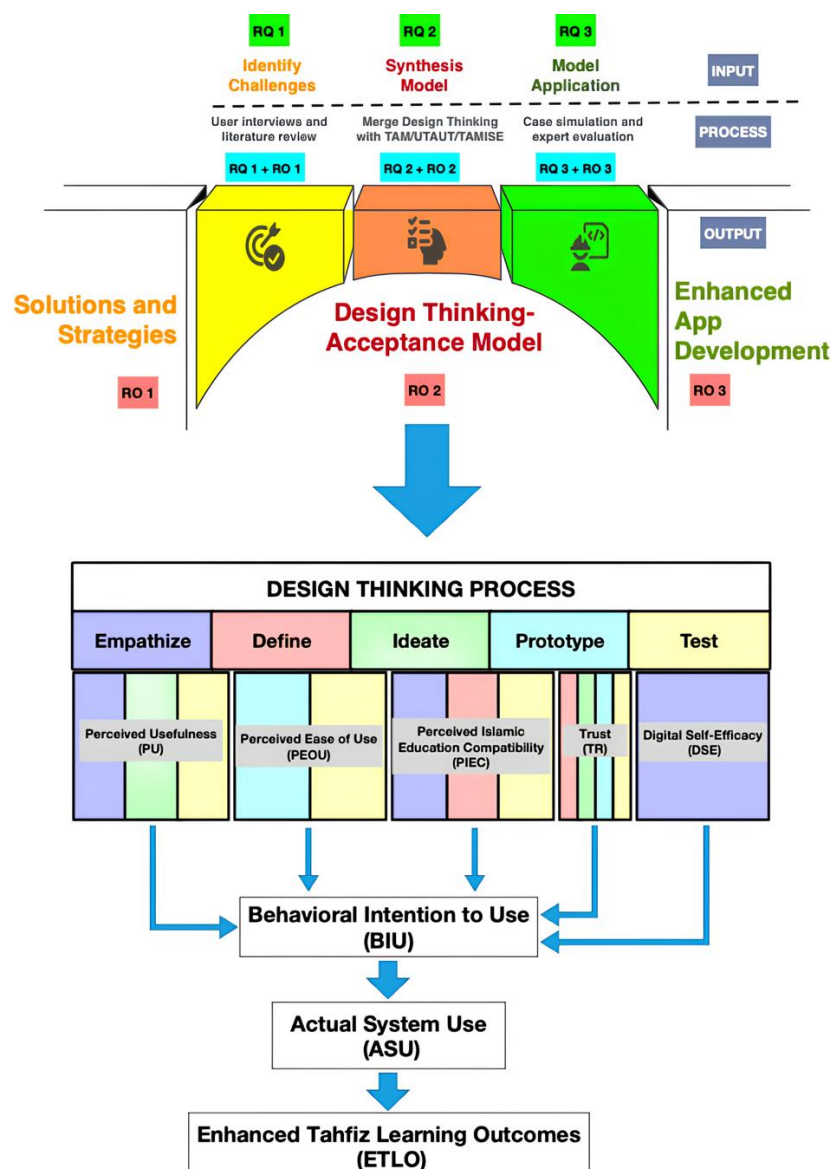
Table 3. Proposed Conceptual Framework Structure

Research Question	Research Objective	Process	Output
RQ1: What are the challenges in enhancing the development of Islamic mobile Quran apps for local Tahfiz?	RO1: To identify the challenges in enhancing development Islamic mobile Quran apps for Tahfiz	- Literature review - User interviews or surveys	Comprehensive list of solutions and strategies to solving the challenges

RQ2: How can a conceptual model that merges Design Thinking with acceptance models be proposed?	RO2: To propose a conceptual model that merges Design Thinking with acceptance models	• Synthesis of Design Thinking stages (Empathize, Define, Ideate, Prototype, Test) • Merge with TAM / UTAUT • Conceptual modeling	Design Thinking-Acceptance Model hybrid framework
RQ3: How can such a model enhance development practices and user engagement in Islamic mobile Quran apps for Tahfiz?	RO3: To suggest how such a model could enhance development practices and user engagement on Islamic mobile Quran apps for Tahfiz	• Model application scenarios • Pilot Tahfiz app prototyping • Expert validation with teachers and religious scholars • Evaluation metrics: usability, acceptance, ETLO indicators	Validated design guidelines and engagement model for Islamic mobile Quran apps for Tahfiz users

The proposed framework positions DT as the design process layer and TAM, UTAUT, and TAMISE as the acceptance-evaluation layer. DT activities generate design decisions, while the acceptance constructs explain whether those decisions are likely to be perceived as useful, easy to use, religiously compatible, trustworthy, and manageable by users with different levels of digital self-efficacy. The framework also links actual system use to ETLO, which must be measured using concrete learning indicators rather than broad claims of improvement.

Figure 1. Conceptual framework for Islamic Mobile Quran Application Development for Local Tahfiz proposed with Design Thinking Acceptance Framework



The framework shown in Figure 1 suggests that the success and impact of Islamic Quran mobile applications for local Tahfiz depend on a human-centered design process that is continuously evaluated through acceptance and learning-outcome indicators. This connection strengthens the practical value of the framework because developers can trace each design decision to user needs, Islamic pedagogical requirements, acceptance factors, and measurable Tahfiz outcomes.

EMPIRICAL VALIDATION AND OPERATIONAL INDICATORS

To address the conceptual nature of the current framework, future studies should empirically validate the model in sequential phases. First, an expert panel consisting of Tahfiz teachers, educational technology researchers, mobile application developers, and religious scholars should review construct relevance, religious appropriateness, and content-verification requirements. A Delphi procedure can be used to obtain consensus across several rounds, while AHP can prioritize constructs and design features according to practical importance. Second, a pilot Tahfiz application prototype should be developed from the framework and tested in a local Tahfiz school. Third, survey data from students and teachers can be analyzed using structural equation modeling, preferably PLS-SEM for exploratory framework validation, to examine relationships among DT-informed design quality, acceptance factors, behavioral intention, actual system use, and ETLO. Finally, mixed-method evaluation should combine usage analytics, recitation assessment, teacher interviews, learner reflection logs, and religious-scholar review to capture both measurable learning outcomes and contextual Islamic educational values.

Table 4. Proposed Operational Indicators for ETLO and Framework Validation

Dimension	Indicator	Example Measurement	Data Source
Memorization retention	Ability to retain previously memorized verses after a defined interval	Percentage of verses correctly recalled after one week or one month	Teacher assessment; app-based revision record
Recitation accuracy	Correctness of pronunciation, tajwid, and sequence	Number of tajwid, pronunciation, or omission errors per recitation session	Teacher rubric; speech-recognition log; scholar-verified rubric
Revision consistency	Regularity of murajaah practice	Number of completed revision sessions per week	App analytics; teacher monitoring
Engagement duration	Sustained use of memorization and revision features	Average session length and active learning minutes	Learning analytics
Learning progress	Movement toward memorization targets	Verses, pages, or juz completed and verified over a semester	Teacher verification; progress dashboard
Spiritual-pedagogical alignment	Perceived fit with Islamic values and Tahfiz pedagogy	Learner, teacher, and scholar ratings of adab, authenticity, and appropriateness	Questionnaire; expert review; interview

These indicators make ETLO observable and allow the framework to be evaluated beyond intention to use. They also support triangulation: app analytics can measure engagement, teachers can verify memorization quality, and religious scholars can assess the authenticity and appropriateness of Quranic content.

RECOMMENDATION

Implications of the Framework for Researchers and Practitioners

The proposed framework benefits both academic research and practical use in Islamic digital education. For researchers, it offers a testable integration of human-centered design, technology acceptance, and religious pedagogy. The framework can be converted into hypotheses, measurement instruments, prototype evaluation protocols, and SEM-based validation models. For practitioners, it guides collaboration among developers, Tahfiz

teachers, students, parents, and religious scholars so that application features are not only technically functional but also pedagogically and spiritually appropriate.

How the Framework Addresses Identified Challenges in Tahfiz App Development

The proposed framework effectively addresses several key challenges commonly encountered in the development of current Tahfiz applications.

1. *Lack of Innovative Approaches and User Engagement:* Design Thinking ideation and prototyping phases enable the testing of novel solutions. This approach advances development beyond generic features, creating methods for memorization and comprehension (M. A. Ibrahim et al., 2024). By emphasizing user desirability, the framework ensures that innovation stems from user needs.
2. *Limited User Friendliness:* Design Thinking requires iterative prototyping and testing so that interface complexity, navigation problems, and cognitive load can be identified early and improved before full deployment (Plattner et al., 2011; Razzouk & Shute, 2012).
3. *Reliability Concerns (Content Authenticity):* The framework integrates “Perceived Islamic Education Compatibility” and “Trust” within Design Thinking’s “Empathize” and “Define” phases, requiring religious scholars’ engagement to verify the credibility of Quranic content (Yusoff et al., 2024).
4. *Traditional Teaching Methods Leading to Boredom:* The framework helps understand teaching through “Empathize,” by creating digital tools that complement traditional methods. These tools make learning interactive instead of replacing old methods (M. A. Ibrahim et al., 2024).
5. *Local Context:* The framework adapts to the cultural, educational (Ariffin et al., 2024), and operational contexts of Tahfiz institutions (M. A. Ibrahim et al., 2024). This approach is crucial, given the diversity of Tahfiz houses and their resource constraints, including limited budgets and staff (Zuhri et al., 2023). Stakeholder engagement ensures local relevance and feasibility of research (Ariffin et al., 2022).
6. *Ethical Concerns with AI:* The framework integrates ethical considerations (Djazilan et al., 2024) into Design Thinking. This approach ensures that AI features align with Islamic principles and are tailored to prevent misinterpretations of religious values.

This framework prevents issues in Tahfiz app development. Considering user needs, ethics, and teaching methods early on can prevent problems. This approach increases success and reduces costly changes, thereby creating stronger applications.

Potential Benefits of Adopting the Framework

The conceptual framework is expected to offer advantages for the growth and influence of Islamic Quran mobile apps in the local Tahfiz community.

1. *Improved User Experience and Engagement:* The framework’s human-centered approach facilitates the development of applications that are intuitive, enjoyable, and motivating, promoting sustained engagement among learners (M. A. Ibrahim et al., 2024).
2. *Enhanced Memorization and Comprehension:* By developing interactive features and personalized learning paths, the framework targets the core objective of Tahfiz education, resulting in more effective memorization and deeper understanding of the Quran (M. A. Ibrahim et al., 2024).
3. *Higher Acceptance and Adoption Rates:* By addressing factors such as perceived usefulness, ease of use, Islamic compatibility, trust, and digital self-efficacy, the framework enhances adoption and sustained utilization within the global Muslim community (Abubakari & Zakaria, 2023).
4. *Ethically Sound Development:* The framework ensures that applications follow Islamic principles and ethical guidelines, fostering trust among users and religious authorities (Yusoff et al., 2024).
5. *Sustainable Innovation:* Design Thinking’s iterative cycle enables continuous improvement as learner needs, teacher practices, institutional policies, and mobile technologies evolve (Plattner et al., 2011; Razzouk & Shute, 2012).

Overall, the framework supports the development of Islamic educational technology that is user-centered, evidence-informed, and religiously trustworthy. Its practical contribution depends on moving from conceptual mapping to prototype-based validation and measurable learning evaluation.

Comparative Discussion with Existing Quran Applications

Existing Quran mobile applications commonly provide digital mushaf access, audio recitation, translations, bookmarks, memorization counters, and sometimes speech-recognition support. These functions are useful, but they are often implemented as isolated features rather than as part of a coherent design-acceptance-learning pathway. The proposed framework improves this situation by asking whether each feature is grounded in user needs, aligned with Islamic pedagogy, easy to use in local Tahfiz routines, trusted by teachers and scholars, and connected to measurable ETLO indicators.

Table 5. Comparative Positioning of Existing Quran App Features Using the Proposed Framework

Existing app focus	Typical strengths	Common limitation	Framework-based improvement
Digital mushaf, translation, and audio recitation	Provides accessible Quranic text and reciter models	Limited adaptation to individual memorization weaknesses and school routines	Use empathy studies to design learner profiles, teacher dashboards, and localized memorization workflows
Memorization trackers and reminders	Supports goal setting and revision scheduling	Often measures completion rather than retention or recitation quality	Connect tracking to ETLO indicators such as retention, recitation accuracy, and teacher-verified progress
Speech-recognition or pronunciation feedback	Can provide immediate practice support	May raise accuracy, tajwid, and religious legitimacy concerns	Require scholar-validated rubrics, transparent error feedback, and human-teacher confirmation
Gamification and engagement features	May increase motivation and repeated use	Risk of superficial engagement if not connected to Tahfiz pedagogy and adab	Evaluate engagement duration together with spiritual-pedagogical alignment and learning outcomes
Generic Islamic learning apps	Covers broad Islamic content and multimedia resources	May not address specific Tahfiz school needs or local cultural context	Apply DT prototyping with students, teachers, and scholars in local Tahfiz settings

This comparison shows that the framework does not merely add new features to existing Quran applications. Instead, it provides a decision structure for evaluating whether features are pedagogically necessary, religiously credible, acceptable to users, and measurable in terms of Tahfiz learning impact.

CONCLUSION

This study proposed an integrated Design Thinking-Acceptance Framework for enhancing Quran mobile applications in Tahfiz education. The framework connects DT stages with acceptance constructs from TAM, UTAUT, and TAMISE, including perceived usefulness, perceived ease of use, Islamic education compatibility, trust, and digital self-efficacy. It further links behavioral intention and actual system use to ETLO, which is operationalized through memorization retention, recitation accuracy, revision consistency, engagement duration, and teacher-verified progress. The revised framework contributes by clarifying how religious, pedagogical, cultural, and usability considerations can be embedded throughout the application development process. However, its scholarly contribution will be stronger when validated through expert panel review, Delphi or AHP prioritization, pilot prototyping, SEM analysis, and mixed-method user studies involving students, teachers, and religious scholars. Such validation will enable the framework to move from conceptual guidance toward an empirically supported model for designing trustworthy and effective Tahfiz mobile applications.

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