Digital Technology in Quranic Learning: Opportunities and Challenges

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Abstract

The development of digital technology has had a significant impact on various fields, including Islamic religious education, especially in learning the Quran. This study aims to examine the opportunities and challenges presented by the use of digital technology in learning the Quran. The research method used is library research with a descriptive qualitative approach. Data were obtained through literature analysis from various sources, such as scientific journals, books, and recent research reports. The results of the study show that digital technology offers various opportunities, such as wider learning accessibility, flexibility of time and place, availability of interactive applications, and increased student learning motivation. However, challenges also arise, including limited digital competence of teachers, lack of curriculum integrated with technology, and potential distractions from digital devices. Therefore, there is a need for teacher training, development of digital media that is in accordance with the principles of Islamic education, and strengthening of technology-based education policies. This study is expected to be a reference in developing effective and sustainable digital-based Quran learning strategies.

INTRODUCTION

The development of digital technology in the era of the industrial revolution 4.0 and society 5.0 has brought major changes in various aspects of human life (Tarantang et al., 2019; Rohida, 2018; Abdullah, 2019). In the world of education, digitalization is a catalyst for the transformation of learning methods that were previously conventional to become more modern, flexible, and interactive.

Islamic religious education, especially learning the Quran, is inseparable from this flow of change.The Quran as the holy book of Muslims has a central position in Islamic education, and learning it is an important part of the formation of character, spirituality, and morals of students. Therefore, adaptation to technological developments is a must so that learning the Quran remains relevant and effective in the digital era (Vassenden & Andersson, 2010; Long, 2010; Siraj, 2016).

Along with the increasing use of digital devices in everyday life, various innovations have been developed to support learning the Quran. Mobile applications such asQuran Companion, Verse, Best Quran, to web-based platforms such asBayyinah TV, Tadabbur.net, And Muslim Pro, has become a new alternative in studying, memorizing, and understanding the contents of the Quran (Alsalem et al., 2023; Sheikh, 2022). Not only that, many educational institutions are now starting to integrate technology into tahfidz, tilawah, and tafsir classes, using audiovisual media, online learning, and interactive videos to improve teaching effectiveness. Great opportunities are wide open. With digital technology, learning the Quran is no longer limited by space and time. Students can learn anywhere and anytime according to their conditions and needs. Learning materials can be repeated easily, access to various qira'at and translations becomes faster, and learning motivation increases thanks to a more visual and attractive approach. Technology also enables collaboration between teachers and students in a more dynamic digital environment, even opening up opportunities for people with disabilities to learn the Quran in a more inclusive way (Black et al., 2020; Hanafi et al., 2019).

However, the use of digital technology in learning the Quran is also not free from various challenges. One of the biggest challenges is the readiness of human resources, especially teachers or ustaz/ustazah, not all of whom have adequate digital competence. Many Quran teachers are still accustomed to traditional methods and are not yet fully capable of operating digital learning devices or applications. In addition, not all educational institutions have facilities and infrastructure that support the implementation of technology, especially in remote areas that still have minimal internet networks or digital devices. In terms of learning substance, there is also concern that digitalization could reduce the depth of the spiritual and adab processes that have so far been the hallmark of Quran education. Intense face-to-face interaction between teachers and students, which has so far been considered important in the process of transferring values and blessings, is feared to be eroded by the online learning process which is dry from the affective dimension. In addition, the potential for distraction from digital devices is also a problem in itself, especially if there is no strict supervision from parents or teachers.

Figure 1 shows the results of bibliometric analysis using VOSviewer based on data from the Scopus database. This visualization shows the relationship between the main keywords related to the theme of technology-based Quran learning. The size of the circle reflects the frequency of occurrence of the keyword, while the color shows the development of time from 2020 to 2023. The interconnected relationships between terms such as "quran," "technology," "learning systems," and "augmented reality" indicate a research focus on the integration of modern technology in supporting Quran learning.
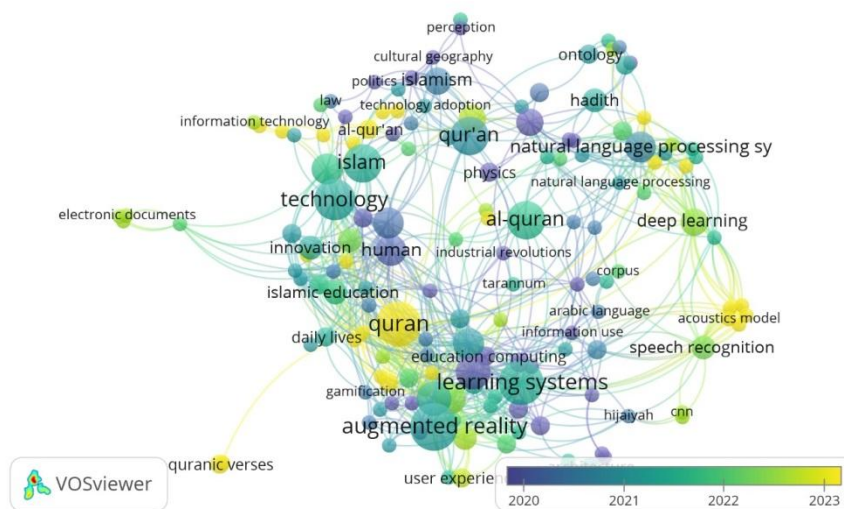
**Figure 1. Digital Technology Keyword Analysis
In Learning the Quran**

Based on the analysis results, it is clear that the theme of technology-based Quran learning has become one of the topics that has continued to grow in recent years (2020–2023). This visualization shows the interconnectedness of various main terms (keywords) that often appear together in related studies (Tohet & Alfaini, 2023; Pandunata et al., 2019). Large nodes such as "quran," "technology," "learning systems," and "augmented reality" show a high frequency of occurrence and indicate the importance of the topic in the academic landscape. Keywords such as "augmented reality" and "user experience" which are brighter in color (yellow-green) indicate that in the more recent period (2022–2023), research has begun to examine the application of immersive technology to improve the effectiveness of Quran learning. Furthermore, the close association of terms such as "natural language processing," "deep learning," and "speech recognition" with "Quran" suggests efforts to develop artificial intelligence-based systems that can facilitate interaction with the text of the Quran, such as in speech recognition for recitation or tarannum training.

The themes of "Islamic education," "innovation," and "electronic documents" that appear around the map indicate that in addition to traditional learning aspects, there is a strong push for digitalization and innovation in Islamic education. This is in line with the global trend where digital transformation also touches the realm of religious education. From this visualization, it can be seen that the "technology adoption" and "human-technology interaction"-based approaches are crucial, indicating that in addition to technical aspects, attention to user experience and acceptance of technology in the Muslim community is also an important focus. Thus, the results of this analysis indicate that technology-based Quran learning is not only developing in terms of technical innovation, but also involves social, cultural, and user experience dimensions. This research trend is predicted to continue to increase along with technological advances such as AI, AR/VR, and adaptive learning systems.

Based on the above background, this study offers novelty by presenting a comprehensive mapping of the dynamics of research on the integration of digital technology in learning the Quran. Different from previous studies that tend to be

descriptive or focus on limited case studies, this study systematically reveals the development of current themes such as the application ofaugmented reality, deep learning, speech recognition, as well as natural language processingin supporting the process of learning the Quran. In addition, this study highlights the latest research trends (2022–2023) which emphasize user experience (user experience) and artificial intelligence-based technological innovations, which have not previously been discussed in depth in the context of Quranic education. Therefore, this study makes a new contribution to the literature by critically identifying the innovative opportunities and multidimensional challenges that arise from the use of digital technology in Islamic education.

The results of this study have a significant impact on the development of science and practice of Quran education in the digital era. These findings can be a basis for educators, educational technology developers, and policy makers in designing Quran learning solutions, based on cutting-edge technology, and responsive to the needs of the digital generation. In addition, by mapping opportunities, challenges and solutions, this study encourages the birth of a more inclusive and effective approach to the transformation of Islamic education. Academically, this study opens up space for further exploration of the integration between smart technology and Islamic values, while enriching the discourse on technology-based education in contemporary Islamic studies.

METHODS

This study uses a descriptive qualitative approach that aims to deeply understand how digital technology is integrated into Quran learning, as well as explore the opportunities and challenges that arise from its implementation. This approach is considered relevant because it is able to explore the meaning, experience, and understanding of educators and students in the context of technology-based Islamic education. This research is included in the type of library research, where data is collected and analyzed through literature reviews sourced from various scientific papers, both national and international journals, academic books, research reports, and online articles that are relevant to the theme of digital technology-based Quran learning. The literature used was selected selectively by considering aspects of recency (published between 2019 and 2024), topic relevance, and source credibility.

The data collection process begins with a literature search using keywords such asdigital Quran learning, technology in Islamic education, Quranic apps, And Islamic digital pedagogy. Next, a selection of the most relevant literature was carried out, then classified based on the main theme, namely the form of technology integration in learning the Quran, the opportunities offered by digital technology, and the challenges faced in its implementation. All data that has been collected is then analyzed descriptively-qualitatively using a content analysis approach. The analysis process is carried out through the stages of data reduction, categorization, interpretation, and drawing conclusions based on the results of the literature review. To ensure the validity of the data in this study, the source triangulation technique is used, namely by comparing information from various types of literature that have different perspectives and contexts. In addition, content validity is strengthened through references to reputable scientific journals and informal consultations with Islamic education practitioners and learning technology experts. with this approach, it is hoped that the results of the study can provide a comprehensive and

scientifically accountable picture of the use of digital technology in learning the Quran.

RESULT AND DISCUSSION

Based on the results of the analysis of various scientific literature, the use of digital technology in learning the Quran opens up various strategic opportunities that have the potential to fundamentally revolutionize the traditional approach to Islamic education. With the increasingly rapid development of information and communication technology, digitalization in learning the Quran is no longer just a complement, but has become a strategic need to answer the challenges of the times, expand the reach of education, and improve the quality of learning the Quran itself. These opportunities can be explained in more detail as follows:

Opportunities for Utilizing Digital Technology in Learning the Qur'a
First Wider Accessibility of Learning

Digital technology enables the massive and even distribution of Quran learning, breaking through geographical boundaries that were previously the main obstacles in Islamic education. Through digital Quran applications, online learning videos, and sharia-based e-learning platforms, students from various socio-economic backgrounds, including those in remote areas, hinterlands, or areas with limited formal education facilities, can now access learning materials more easily. In the concept of ubiquitous learning, learning is no longer limited to physical classrooms, but can take place anytime and anywhere. The presence of the internet, smartphones, and mobile learning applications has made the Quran easier to learn in various situations: while traveling, in between daily activities, even from home without the need to be physically present at educational institutions. This digitalization of learning also indirectly supports the agenda of equalizing Islamic education at the global level, reducing the disparity in access to education between urban and rural areas. For example, platforms such as Quran Companion or Bayyinah TV offer mobile and desktop-based learning services that can be accessed across countries, proving that geographical boundaries are now increasingly surmountable (Nurdiana & Zainiyati, 2020; Maulana & Nasir, 2022; Herman et al., 2019).

Both Flexibility of Time and Place

Digital technology provides flexibility in time and place dimensions that were previously impossible to achieve through conventional learning methods (Hills & Thomas, 2019; Gao et al., 2022; Von Solms & Langerman, 2021; Wallace et al., 2022). Learners can choose when and where they learn, without having to adjust to the fixed schedule of the educational institution or the physical presence of the teacher. Asynchronous learning models such as video recordings of tahsin studies, Quran memorization tutorials, and interactive applications based on self-paced learning allow learners to regulate their learning rhythm according to their personal capacity and daily conditions. Thus, the concept of self-regulated learning is further strengthened, where learners play an active role in designing, managing, and evaluating their own learning. In addition, this flexibility encourages the inclusion of Quran education for groups with limited time, such as workers, students, or housewives. Recent studies show that the existence of digital-based flexible learning can increase the level of education participation by up to 40% in

these groups.

Third Availability of Applications and Interactive Media

In recent years, there has been an explosion of innovation in applications and digital media for learning the Quran. Not only are digital mushaf applications available, but also platforms with advanced features, such as tahsin checkers (reading accuracy checkers), gamification (memorization and tajwid-based educational games), and voice recognition systems to automatically detect mispronunciation of letters and makhraj (Aminudin et al., 2019). These applications enrich the learning experience by presenting a multimodal approach, combining text, audio, visuals, and interactivity to create learning that is more adaptive to various learning styles: visual, auditory, and kinesthetic. For example, the game feature in applications such as Learn Quran Tajwid allows users to learn the laws of tajwid reading while playing, making the learning process more lively, fun, and not monotonous. It is important to note that the interactivity provided by this digital media has been empirically proven to be able to increase cognitive effectiveness, accelerate the acquisition of skills to read the Quran properly and correctly, and increase memorization retention of students compared to traditional lecture methods.

Fourth, Increasing Student Motivation and Participation

The use of digital media in learning the Quran has a significant influence on students' learning motivation (Taufik et al., 2022; Aseery, 2023). The integration of multimedia elements such as animated videos, visual illustrations of tajweed, game-based memorization quizzes, and the use of Islamic background music has been proven to increase student engagement in the learning process. Research by Al-Amin (2022) shows that the use of gamification in learning the Quran can increase active participation of students by 30-40% compared to conventional methods. In a digital learning environment, students feel more challenged to complete memorization targets, improve their reading, and understand the rules of tajweed through a reward system in the form of badges, points, or virtual certificates. In addition, interactive visualizations also help clarify abstract concepts in tajweed, such as mad, ghunnah, or idgham, which are often difficult to understand through traditional oral methods. Thus, technology-based Quran learning not only increases students' intrinsic motivation, but also strengthens their conceptual understanding of the content and rules of reading the Quran.

The use of digital technology in learning the Quran has opened up new horizons in the world of Islamic education, presenting various conveniences such as accessibility of materials, flexibility of learning methods, and the ability to integrate interactive media that enrich students' learning experiences. However, along with the great opportunities, fundamental challenges also arise that need to be identified and anticipated systematically. Without the right strategy, the use of digital technology has the potential to weaken the essence of Quran education which is based on purity, perseverance, and high manners. Based on findings in various scientific literature studies, several main challenges faced in the use of digital technology in learning the Quran can be described as follows.

Challenges of Utilizing Digital Technology in Learning the Quran

First Limitations of Teachers' Digital Competence

One of the most fundamental obstacles in implementing digital technology in learning the Quran is the limited digital competence among educators. Many Quran teachers, especially those with traditional educational backgrounds such as Salafiyah Islamic boarding schools, do not yet have adequate digital literacy to utilize technology as a learning tool. Surveys conducted by several Islamic educational institutions show that less than half of Quran teachers feel comfortable using technology-based learning tools such as Learning Management Systems (LMS), interactive Quran applications, or video conference platforms such as Zoom and Google Meet (Quast et al., 2023; Saaiq et al., 2024; McGarr & McDonagh, 2020; Caepenter et al., 2024).

These limitations have an impact on the low adoption of blended learning methods and online learning based on the Quran. Teachers tend to stick to conventional methods such as talaqqi and musyafahah, even though the reality of today's students has shifted to become digital natives, namely a generation that is familiar with technology from an early age. As a result, there is an imbalance in expectations between the teaching methods delivered by teachers and the learning preferences of students, who expect more dynamic, interactive, and technology-based learning. Furthermore, this low digital literacy is not only a technical problem, but also related to psychological aspects such as fear of failure (technophobia) and reluctance to leave the comfort zone of traditional methods. Therefore, systematic intervention is needed through ongoing training programs based on teacher needs, mentoring the use of technology practically, and strengthening teachers' internal motivation towards the importance of digitalization in supporting the mission of Islamic preaching and education in the contemporary era.

Second Lack of Curriculum Integrated with Technology

The next challenge lies in the curriculum aspect. Currently, most Islamic educational institutions still adopt a Quran learning curriculum that does not consider the integration of technology systematically and structured. The integration of technology in Quran learning occurs more often due to individual teacher initiatives or limited experimental projects, not as part of institutional policies or national curriculum directives. As a result, the use of technology in Quran learning tends to be inconsistent, the impact is not measurable, and is not sustainable. There are institutions that have utilized digital platforms to facilitate online memorization and tajwid exams, but there are also institutions that have not been touched by technology at all in the Quran learning process (Alvendri et al., 2023; Sari et al., 2023).

The absence of guidelines and standards for the use of this technology has a serious impact on the quality of learning output. The great potential offered by digital technology, such as personalized learning based on student needs, real-time memorization development analytics, or strengthening the visualization of the meaning of the verses of the Quran, is underutilized. In fact, with the implementation of the right blended learning approach, the process of learning the Quran can be more interesting, measurable, and meaningful. In the long term, the solution to this challenge is to design a technology-based Quran learning curriculum that combines the strengths of traditional methods (such as talaqqi, tasmi', and musyafahah) with digital innovation, and to set relevant achievement indicators for aspects of material mastery, digital skills, and strengthening Islamic moral values.

The Three Potential Distractions of Digital Devices

Along with the introduction of digital technology in learning the Quran, serious challenges have emerged in the form of high potential for distraction among students. The devices used to access digital Quran materials also allow students to easily switch to entertainment content, such as social media, online games, or non-educational videos (Khairati, 2022; Hidayat, 2016; Hanafri et al., 2019). Research in the field of educational neuropsychology shows that digital multitasking can inhibit concentration, slow down the speed of understanding, and reduce the quality of memory retention. In the context of learning the Quran, this distraction has the potential to be more dangerous, because it can reduce the solemnity, manners, and sincerity of students in interacting with the great words of Allah.

Furthermore, excessive dependence on digital devices without adequate supervision can change learning motivation from intrinsic motivation (because of love for the Quran) to extrinsic motivation (because of simply following online assignments), thus eroding the spirit of spirituality in the learning process. To overcome this challenge, a comprehensive approach is needed that includes the use of a special learning platform based on the Quran that limits access to other applications during learning (safe mode), instilling ethics in the use of technology (digital ethics), and active involvement of parents in monitoring the use of devices outside of study hours.

Fourth Availability and Validity of Digital Content

The validity of the content of the Quran in the digital world is another crucial challenge that cannot be ignored. The increasing number of Quran applications, tafsir websites, tajwid platforms, and online learning media have enriched the choice of learning resources. However, not all of these platforms have gone through a strict scientific verification process. Many fatal errors were found, such as errors in writing the text of the Quran, pronunciation of tajwid that does not comply with the rules of tajwid science, or interpretations of meaning that deviate from the mu'tabar interpretation. In the context of Islamic education, these errors not only impact the academic quality of students, but can also mislead the understanding of aqidah and shari'ah.

This phenomenon demands serious attention from educators, educational institutions, and policy regulators. There must be quality standards and certification for digital applications and platforms that provide Quranic content, as well as an obligation to include clear scientific reference sources. Scholars and Quranic experts need to be actively involved in the process of compiling, verifying, and evaluating digital Quranic educational content. In addition, students need to be equipped with Islamic information literacy skills, so that they are able to identify and sort authentic and reliable learning sources. This literacy education not only teaches the technical aspects of choosing authentic sources, but also builds a critical Islamic attitude (al-fikr al-naqdi al-Islami) towards every information received from cyberspace.

Overall, the use of digital technology in learning the Quran does offer the potential for great transformation in improving the quality of Islamic education. However, the existing challenges, ranging from limited teacher competence, lack of curriculum integration, high potential for distraction, to the problem of digital content validity, show that the adoption of technology must be carried out with a careful, systematic approach, and based on solid Islamic principles. Without serious

efforts to overcome these challenges, the use of technology is at risk of obscuring the noble values in learning the Quran itself.

Strategic Solutions in Optimizing Digital-Based Al-Quran Learning

In the era of digital transformation, learning the Quran faces both challenges and enormous opportunities. Digitalization offers wider access, flexibility in delivery methods, and innovation in evaluating learning outcomes. However, on the other hand, challenges in the form of technological competency gaps among teachers, irregular curriculum, weak content regulations, and the potential for degradation of Islamic moral values are things that cannot be ignored. Therefore, a systematic and implementative strategic solution is needed to optimize digital-based Quran learning. These solutions include training and improving teacher competencies, developing a technology-integrated curriculum, strengthening regulations on digital content, and raising awareness of digital ethical values in every learning process (Said, 2020).

First Training and Improvement of Teacher Competence

One of the main strategies in optimizing digital-based Quran learning is improving teacher competency through ongoing training programs. Teacher competency in the field of educational technology is a key factor in the success of implementing digitalization of Quran learning. Teachers not only need to understand the techniques of using hardware and software, but are also required to be able to adapt Islamic pedagogical methods into the digital learning ecosystem. In this context, training must be designed with an approach*continuous professional development*(CPD), which provides space for teachers to gradually improve their skills through workshops, online courses, and*technical mentoring.*

Training materials should include an introduction to modern Islamic educational applications, such as application-based tajwid learning platforms, sharia social media, and the use of Islamic-oriented Learning Management Systems (LMS). In addition, teachers need to be trained in online classroom management, including creating a virtual classroom atmosphere that maintains Islamic manners, digital etiquette, and collaboration based on Islamic brotherhood values. These efforts must be supported by technical assistance programs to ensure effective skill transfer. With ongoing training, teachers will become agents of change who are able to direct the digital transformation of Quran learning in a dignified and effective manner.

Second Technology Integrated Curriculum Development

In addition to improving teacher competency, another crucial strategy is the development of an integrated Al-Quran learning curriculum with digital technology. A curriculum that is adaptive to the development of the times needs to be designed so that Al-Quran learning remains relevant, interesting, and forms Islamic character amidst the dominance of technology. This integration must be systematic, not just an addition, but an integral part of the curriculum structure itself. This means that the use of digital applications, projects based on sharia social media, and online evaluations must be planned and standardized in accordance with the goals of Islamic education (Nur'ariyani et al., 2022).

For example, a student's routine assignment may involve using a digital application to improve their tajweed reading, while a learning project may involve

creating a *vlog recitation*, *tadabbur verse podcast*, or short videos about the meaning of the verses of the Quran which are then published on online learning platforms. Learning evaluation can also be done through online quizzes, digital portfolios, or *peer assessment* based on honesty and trustworthiness values. This integrative curriculum must maintain the principle of the authenticity of the Quran, by prioritizing the validity of the holy text, the sanad of the reading, and the authentic interpretation. Thus, the use of technology will not erode the sanctity of the Quran, but rather enrich the learning method while strengthening Islamic values.

Third Strengthening Regulation and Supervision of Digital Content

Optimization of digital-based Quran learning will not be achieved without strengthening regulations and supervision of circulating digital content (Ernawati & Nugraheni, 2020). The current era of open information facilitates the distribution of various applications, websites, and learning media based on the Quran. However, most of this content has not gone through an adequate academic and theological validation process, so it is at risk of presenting incorrect, even misleading information. Therefore, it is urgent to establish a national certification body or authoritative institution tasked with verifying, validating, and supervising all digital content related to Quran learning.

This body must have strict evaluation standards, covering aspects of the correctness of the Arabic text, the accuracy of the tajweed, the sanad of the reading, and the validity of the interpretation used. In addition, the institution also needs to provide guidance to application developers so that they always refer to the principles of Islamic science. Strengthening this regulation also includes creating a list of certified Al-Quran applications, platforms, or digital media, so that educators, students, and the general public can refer to trusted sources. With strict and systematic supervision of digital content, the quality of technology-based Al-Quran learning can be maintained, and the younger generation can be protected from exposure to inaccurate religious information.

Fourth Awareness of Digital Ethics in Learning

The last strategy that is no less important in optimizing digital-based Quran learning is to raise awareness of Islamic digital ethical values to all education actors, especially students. In the midst of the rapid flow of digital information, Islamic moral values are at risk of being marginalized if not consistently instilled. Therefore, digital ethics education must be an integral part of the Quran learning curriculum, not just an addition. Students need to be guided to understand the importance of maintaining the intention to learn solely for the sake of Allah SWT, not for popularity or simply gaining recognition in cyberspace. They must also be taught to avoid useless content that can distract from the main purpose of studying the Quran. Furthermore, digital technology must be utilized as a means of preaching, disseminating knowledge, and a medium to strengthen Islamic brotherhood.

This digital ethics education also includes respect for intellectual property rights, such as the use of officially licensed applications, citing reference sources, and respecting the privacy of fellow digital users. Instilling these values can be done through Islamic-based digital literacy, online character mentoring programs, and the integration of noble moral values in every digital learning project. By building a strong awareness of digital ethics, learning the Quran will not only produce a generation that is technologically literate, but also a generation that has noble

morals, maintains manners, and honors the Quran in every online activity.

All over The results of this study explicitly show that the use of digital technology in learning the Quran can no longer be viewed as an additional alternative, but has become an absolute necessity amidst the rapid flow of digital disruption. Digital transformation has touched almost all aspects of human life, including in the field of Islamic education, so that learning the Quran is also required to adapt in order to remain relevant, effective, and able to reach various groups. The use of technology in learning the Quran has great potential in expanding access to learning resources, improving the quality of interaction between teachers and students, enriching the variety of methods of delivering material, and accelerating the distribution of Quran education in various levels of society. However, the integration of digital technology in learning the Quran cannot be done haphazardly. The sanctity of the Quran as a holy book must remain the main consideration in every learning innovation. Therefore, mitigation strategies against potential challenges, such as declining quality of manners in digital interactions, the spread of unvalidated content, and misuse of technology, must be designed carefully and based on sharia principles. Every digitalization effort must always pay attention to scientific ethics, maintain the authenticity of the text of the Quran, and uphold Islamic values in every stage of its development and implementation.

The practical implications of this study include several important aspects. First, for teachers, this study emphasizes the importance of adopting a new paradigm in teaching, namely a digital-based learning paradigm that still upholds the traditional values of Quranic scholarship. Teachers are required to not only understand the techniques of using technology, but also be able to combine digital sophistication with the principles of Islamic manners. In this case, teachers must act as moral guides in the digital era, instilling in students that learning the Quran through digital media must still be based on sincere intentions, noble manners, and respect for knowledge and its sources. Second, for educational institutions, this study provides a strong impetus to develop strategic policies that are integrative and adaptive to technological developments. Islamic educational institutions must formulate regulations that govern the responsible use of technology in learning, integrate digital devices into the Quranic learning curriculum, and provide competent facilities and human resources to support the implementation of digital-based programs. In addition, educational institutions also need to conduct periodic monitoring and evaluation of the use of technology in learning, to ensure that the digital transformation is in accordance with the mission of Islamic preaching and education.

Third, for developers of digital applications and media, this research is an important reference for creating valid, interactive, innovative, and sharia-compliant Quran learning products. Developers are required to pay attention to content validity, strengthen interactivity elements to improve the user's learning experience, and ensure that all application features support the formation of Quranic characters that are in accordance with Islamic values. In addition to technical aspects, developers also need to consider ethical and aesthetic aspects in their application design, so that technology truly becomes a tool that glorifies the Quran and makes it easier for people to get closer to Allah SWT. Ultimately, digital transformation in Quran learning must be understood not merely as an effort to follow the times or global trends, but as part of the actualization of Islamic teachings in facing the

dynamics of the times. The digitalization of Quran learning should be directed to building a Quranic generation that is adaptive to change, smart in utilizing technology, critical in sorting information, and has noble morals in all its activities, both in the real world and the virtual world. Thus, technological progress is not a threat to the sanctity of learning the Quran, but rather a means to expand da'wah, strengthen Islamic brotherhood, and form an Islamic civilization based on the values of the Quran.

CONCLUSION

Digital-based Quran learning is a necessity in the era of technological disruption. Digital technology opens up great opportunities to expand access, increase the effectiveness of learning, and enrich Quran teaching methods. However, its utilization must be accompanied by mitigation of challenges, such as maintaining the authenticity of content, digital ethics, and Islamic values. Optimizing this learning requires continuous teacher training, development of technology-based curriculum, strengthening Islamic digital content regulations, and instilling digital ethics in students. All stakeholders need to work together to build an adaptive learning ecosystem that is still based on Islamic principles. With a balance between innovation and preserving sacredness, technology can be a means of bringing people closer to the Quran and creating a Quranic generation that is intelligent, has integrity, and has noble morals.

DECLARATIONS
Author Contribution
Umar Akem & Nurul Majeedah Hamdan: Improve Language, Improve Content **M.Yakub Iskandar:** Conceptualization, Writing-Original draft preparation, **Efendi & Nur Halimahturrafiah:** Data accuracy, Methodology

AI Statement
The data and language usage in this article have been validated and verified by English language experts and no AI-generated sentences are included in this article.

Conflict of Interest
The authors declare that this research was conducted without any conflict of interest in the research.

Ethical Clearance
The place or location studied has agreed to conduct research and is willing if the results of this study are published.

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