



Empowering pilgrims through digital literacy: Evaluating ritual understanding via Mobile Hajj Applications at KBIHU Ahmad Dahlan

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ABSTRACT

This community service initiative evaluates the impact of mobile applications, namely *Haji Pintar–Satu Haji* and *Kawal Haji*, in enhancing digital literacy and ritual understanding among pilgrims at KBIHU Ahmad Dahlan, Pringsewu. The program was implemented over a one-month period and involved participants engaging in mobile-based tutorials and mentoring activities designed to support comprehensive Hajj preparation. The learning materials focused on improving participants' understanding of Hajj rituals while simultaneously strengthening their ability to use digital applications effectively. Survey results indicated that nearly all participants had access to Android smartphones, with 41.3% of respondents assessing their digital skills as "very good." Among the available features, video tutorials were the most frequently accessed, accounting for 34.8% of usage, as they were perceived as clear and easy to understand. The majority of pilgrims reported improved comprehension of Hajj rituals after participating in the program. Despite these positive outcomes, several challenges were identified, including infrequent application usage, accessibility limitations for some users, and participant requests for offline learning content. Overall, the findings demonstrate the significant potential of mobile applications to support Hajj preparation through religious education and digital engagement. The study recommends further development through more inclusive application design, offline accessibility, and sustained digital engagement strategies to enhance the effectiveness of community outreach programs in religious education.



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1. INTRODUCTION

The pilgrimage to Mecca, known as Hajj, is a compulsory religious obligation for Muslims who are both physically and financially prepared to undertake it. It consists of a series of complex rituals that must be performed in a specific sequence and within a particular timeframe [1]. For many pilgrims, especially first-time visitors, understanding the ritual, logistical, and spiritual aspects of Hajj can be challenging.

Given the high spiritual significance of each step in the pilgrimage, adequate preparation is essential.

Mistakes during the ritual may not only invalidate portions of the Hajj but also diminish the overall spiritual value of the pilgrimage for the pilgrim [2, 3, 4]. Therefore, access to accurate, comprehensive, and user-friendly educational resources is vital for ensuring that pilgrims perform their obligations correctly and with confidence.

In Indonesia, which sends the most significant number of Hajj pilgrims globally, efforts to provide preparatory guidance have traditionally relied on offline methods—face-to-face lectures, printed booklets, and seminars organized by religious authorities and Hajj guidance groups known as *Kelompok Bimbingan Ibadah Haji dan Umrah* (KBIHU). While effective to an extent, these methods often face logistical constraints and may not sufficiently accommodate individual learning styles or schedules [5, 6, 7, 8].

Digital technology has emerged as a powerful complement to traditional Hajj education. The Indonesian Ministry of Religious Affairs has endorsed the development and deployment of mobile applications such as *Haji Pintar-Satu Haji* and *Kawal Haji*, which aim to enhance pilgrims' preparedness through features like interactive tutorials, maps, ritual simulations, and real-time updates [9, 10, 11]. Other platforms, such as locally developed apps by KBIHU organizations, offer similarly structured digital support.

Mobile applications hold particular promise for adult learners, who benefit from self-paced, visual, and accessible content that can be revisited at any time [12]. Moreover, these platforms can support pilgrims not only during preparation in their home country but also during their journey and stay in Saudi Arabia. They help bridge the informational gap and offer just-in-time assistance during the execution of rituals.

However, the success of such digital interventions hinges on two critical factors: the digital literacy of the target users and their ability to translate app-based knowledge into ritual understanding [12, 13]. While Indonesia has seen a rise in mobile internet penetration, digital proficiency—especially among elderly pilgrims—remains uneven. Many prospective pilgrims come from rural or semi-urban backgrounds where smartphone use may be limited to basic communication [14].

This disparity underscores the importance of evaluating both the technological accessibility of mobile applications and their instructional effectiveness in conveying ritual knowledge [15]. Without adequate alignment between content design and user needs, these digital resources may fail to achieve their intended impact. Previous studies in digital Islamic education have demonstrated the potential of mobile learning tools to enhance knowledge retention, learner autonomy, and engagement [16, 17]. Nonetheless, few investigations have focused on mobile applications within the specific context of Hajj preparation among Indonesian Muslim communities.

This community service initiative was undertaken to examine how digital platforms are being used to support Hajj education at the local level. Centered on KBIHU Ahmad Dahlan in Pringsewu, Lampung, the outreach targeted a group of prospective pilgrims engaged in structured digital learning as part of their pre-departure preparation. The primary aim of this engagement project was to assess levels of digital literacy and ritual comprehension among participants following their exposure to mobile applications including *Haji Pintar-Satu Haji*, and *Kawal Haji*. It aimed to assess how effectively these tools facilitated users' understanding and practice of the core components of Hajj rituals. The outreach was implemented through a combination of content development, video-based instruction, WhatsApp group mentoring, and digital surveys. This multi-platform strategy enabled participants to engage with learning materials asynchronously and to receive real-time support as needed [18, 19, 20, 21, 22, 23].

This initiative contributes to the discourse on community-based religious education by offering empirical insights into the role of mobile technology in facilitating ritual readiness. It also examines the pedagogical benefits of incorporating mobile applications into grassroots-level Islamic education. The findings offer valuable insights for developers, religious educators, and policymakers seeking to enhance the delivery of Hajj guidance to a digitally connected yet demographically diverse population. The analysis highlights key challenges, including technological barriers and instructional gaps, alongside best practices for designing inclusive educational tools.

This outreach effort demonstrates that mobile applications, when effectively deployed, can enhance pilgrims' confidence, comprehension, and overall preparedness. However, it also emphasizes that success depends on factors beyond technology—namely, cultural relevance, simplicity of interface, and institutional support. By aligning digital strategies with community needs, initiatives such as this one can serve as scalable models for other KBIHU organizations across Indonesia. Ultimately, such efforts can improve the quality of the Hajj experience and reduce the risk of ritual errors among first-time pilgrims.

Through this community-driven exploration of mobile learning, the project reaffirms the importance of inclusive, accessible, and context-sensitive educational approaches in religious life. The outcomes not only inform future improvements to Hajj-related applications but also serve as a foundation for broader digital literacy programs in the Muslim community.

The integration of digital literacy and ritual comprehension in this program is essential because the effectiveness of mobile Hajj applications relies not only on access to technology but also on users' ability to

interpret and apply the ritual information conveyed digitally. By combining digital skills training with ritual instruction, the program aims to ensure that technological tools are meaningfully translated into spiritual preparedness.

2. METHODS

This community service project was conducted in Pringsewu Regency, Lampung Province, with a specific focus on the pilgrim group affiliated with KBIHU Ahmad Dahlan. The location was selected due to its high concentration of prospective Hajj pilgrims, making it a strategic site for digital outreach involving mobile Hajj guidance applications. Activities were centered at the KBIHU Ahmad Dahlan office, located at Masjid Taqwa, https://maps.app.goo.gl/j1j3yNH9uTz614Tj9?g_st=aw, Jl. Jenderal Sudirman, Pringsewu.

The implementation phase lasted approximately one month, as depicted in [Figure 1](#), and followed a structured progression consisting of initial planning, a needs assessment with KBIHU representatives, the formulation of objectives and proposals, the development of instructional materials, and the digital dissemination of content. This sequence was designed to ensure alignment between the pilgrims' needs and the instructional strategies employed.

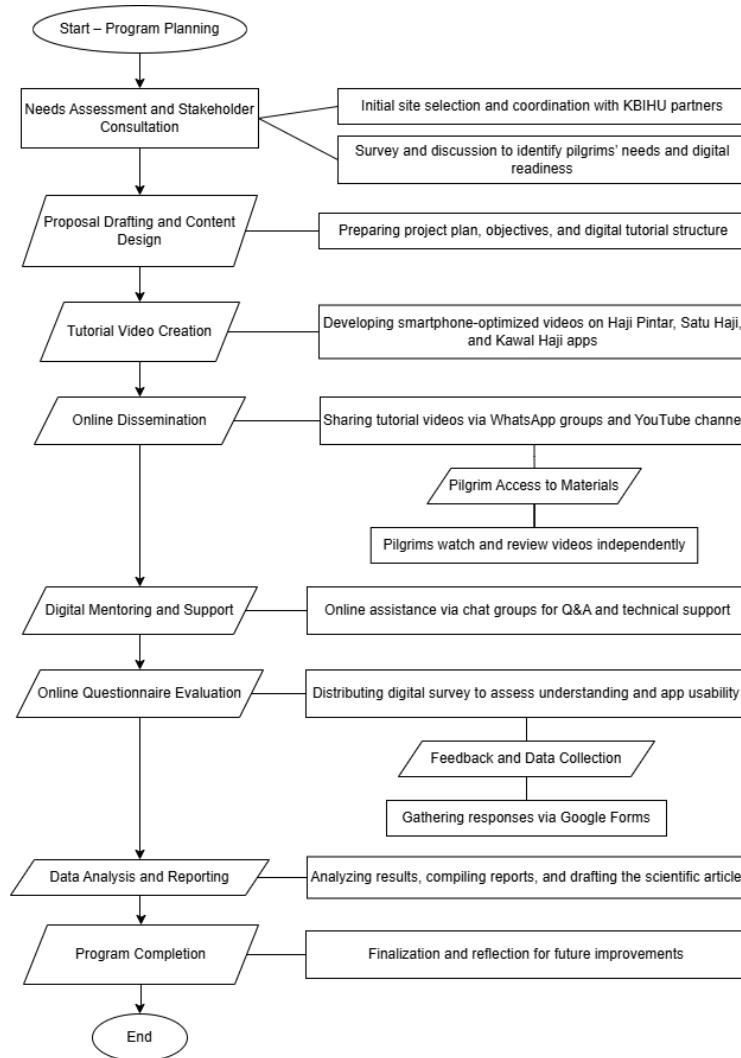


Figure 1. Workflow of the digital outreach initiative for supporting Hajj pilgrim education and training

The central component of the intervention was the creation of a series of mobile-optimized video tutorials introducing the *Haji Pintar-Satu Haji*, and *Kawal Haji* applications. As illustrated in [Figure 2](#), these tutorials were designed to provide step-by-step guidance in navigating the core features of each application, with a focus on supporting users in understanding key rituals required during the Hajj pilgrimage.

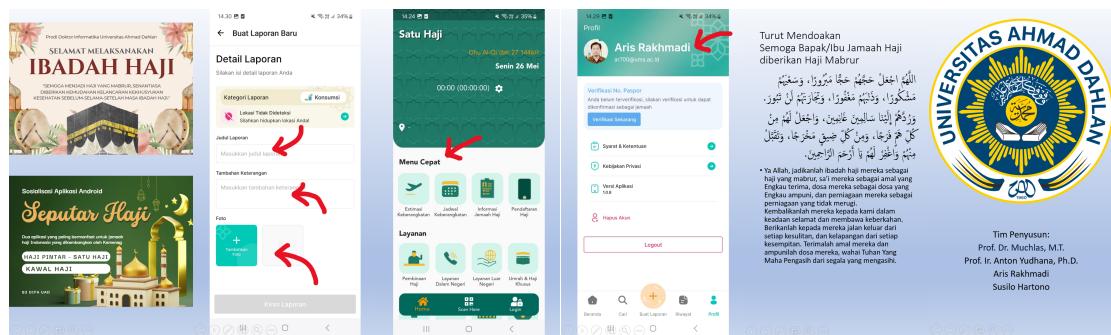


Figure 2. Visual content from the mobile tutorial used to enhance Hajj ritual understanding

Materials were distributed online through channels familiar to the target audience, particularly WhatsApp groups and the YouTube account. This asynchronous delivery format enabled pilgrims, both in Indonesia and in Saudi Arabia, to access the content at their convenience. Digital dissemination was chosen to ensure broad accessibility, eliminate geographic barriers, and promote flexible learning at the participants' own pace.

The target group comprised pilgrims officially registered with KBIHU Ahmad Dahlan, specifically those who owned Android smartphones to ensure compatibility with the mobile applications introduced. As illustrated in [Figure 3](#), staff members were seen providing orientation and digital outreach to group leaders and representatives of the pilgrims. The KBIHU personnel played a pivotal role as community partners, facilitating data collection, managing communication logistics, and coordinating outreach through established digital channels. Their active involvement ensured the efficient distribution of educational materials and evaluation tools, thereby enhancing participant engagement and the reliability of the data collected.



Figure 3. KBIHU staff delivering digital orientation to group leaders and pilgrim representatives

Following the dissemination of tutorial content, participants were invited to join follow-up mentoring through WhatsApp chat groups. This space allowed them to ask questions, receive technical assistance, and interact with facilitators throughout the learning process. After the online mentoring phase, participants completed an evaluation questionnaire, which was distributed via Google Forms.

The instrument for evaluation comprised closed questions employing both Likert scales and multiple-choice responses. It aimed to assess three main aspects: the perceived usefulness of the mobile applications, ease of access and use, and their contribution to ritual understanding. The questionnaire was designed to be simple and accessible, minimizing the technological barrier for older or less digitally literate respondents.

Descriptive statistical methods, such as frequency distributions, percentage analyses, and cross-tabulations, were employed to analyze the quantitative data. This analysis identified usage patterns, obstacles faced, and user perceptions. In addition to numerical data, qualitative observations were drawn from participants' interactions during online mentoring sessions. These interactions provided supplementary insight

into levels of engagement, areas of confusion, and contextual feedback on the utility of the applications.

Participants included 46 prospective pilgrims registered at KBIHU Ahmad Dahlan, consisting of 28 women and 18 men, ranging in age from 30 to 65 years. Most participants came from lower-middle socioeconomic backgrounds, with occupations including farmers, traders, teachers, and retirees. All participants were invited by KBIHU staff to join the program voluntarily and were provided technical assistance during each phase of the activity.

Success indicators included participants' ability to comprehend the ritual content delivered via the applications, the volume of questionnaire responses (targeting at least 60% participation), and the reduction of technical difficulties in accessing app features. Furthermore, increased user confidence and satisfaction with digital learning formats were taken as indicators of the outreach's educational effectiveness. These findings inform future strategies for digital Hajj preparation and broader community-based religious technology interventions.

3. RESULTS AND DISCUSSION

The digital outreach involving *Haji Pintar-Satu Haji*, and *Kawal Haji* applications at KBIHU Ahmad Dahlan Pringsewu succeeded in engaging the majority of its target audience. Active participation by pilgrims, primarily through watching tutorial videos and interacting in online mentoring, demonstrated strong enthusiasm for integrating technology into Hajj preparation. These mobile applications proved effective in offering accessible and interactive learning resources, significantly enhancing practical understanding.

Data collected through structured questionnaires revealed several critical dimensions, including perceived usefulness, ease of use, and functional challenges. This section outlines a comprehensive analysis of the findings and their implications for digital religious education.

3.1. Demographic Characteristics and Digital Readiness

Based on the responses from 46 participants, as illustrated in [Figure 4](#), the majority were in the productive age category. Specifically, 65.2% were under the age of 40, 21.7% were between 41 and 50 years old, and only 2.2% were over 60 years old. The predominance of younger users suggests a strong baseline of digital adaptability. This is consistent with research indicating that age is significantly correlated with the ability to operate mobile applications, particularly for learning purposes. Nonetheless, elderly users remain a vulnerable group and require support through personalized guidance or simplified instructional materials.

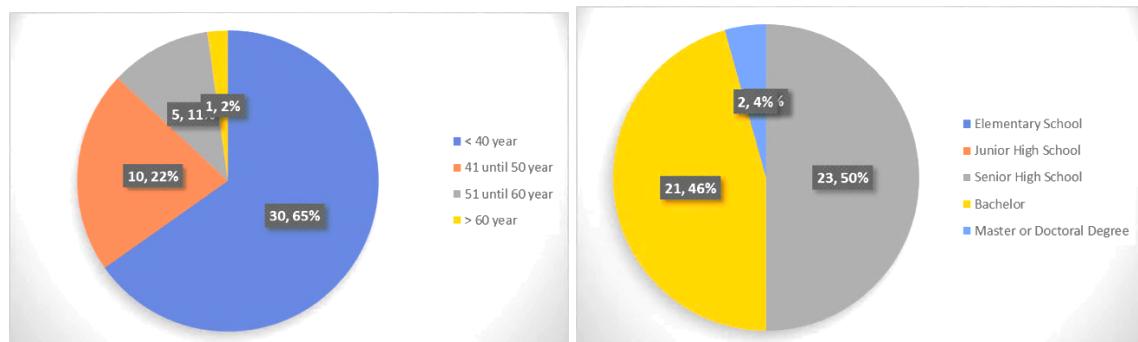


Figure 4. Demographic pilgrims at KBIHU Ahmad Dahlan. The majority of participants are under 40 years old, indicating a strong potential for digital adoption in mobile-based Hajj education.

Regarding educational background, 50% of participants had completed senior high school, 45.7% held diplomas or undergraduate degrees, and only 4.3% had attained postgraduate education. No respondents came from elementary or junior secondary backgrounds. This relatively high educational profile correlates positively with digital competence, affirming previous studies that link education level with openness to digital learning tools. Despite this, all digital content must remain accessible in both language and structure to accommodate a wide range of literacy levels.

3.2. Pilgrimage Experience and Instructional Needs

The survey also indicated that 73.9% of participants had never performed the Hajj, while 17.4% were first-time pilgrims preparing to undertake the Hajj for the first time, as illustrated in [Figure 5](#). Only 8.7% had prior experience. This predominance of first-timers underscores the urgent need for structured guidance that is flexible and repeatable. The use of *Haji Pintar*, *Satu Haji*, and *Kawal Haji* is highly relevant for this group,

offering modular, self-paced learning in a format that supports autonomous mastery of Hajj rituals.

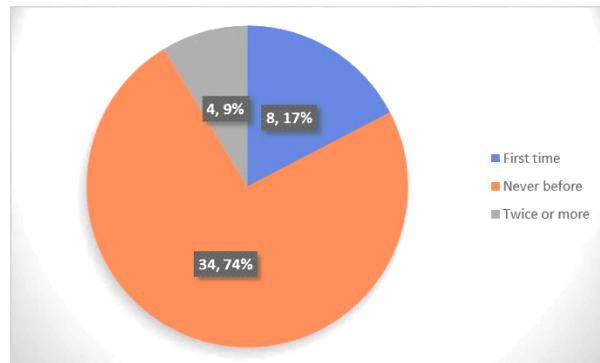


Figure 5. Hajj experience background of pilgrims at KBIHU Ahmad Dahlan. Most participants were preparing for their first pilgrimage, indicating a strong need for flexible, self-paced digital guidance.

3.3. Digital Proficiency and Application Use

In terms of smartphone proficiency, as illustrated in [Figure 6](#), 56.5% of respondents rated themselves as "adequate" users, while 41.3% rated themselves as "highly proficient." Only 2.2% admitted having limited ability. This general competence confirms that mobile application-based programs are appropriate for the majority of pilgrims, while still requiring targeted support for less tech-savvy users. This was further confirmed by high engagement with the video tutorial method and self-navigation within the apps.

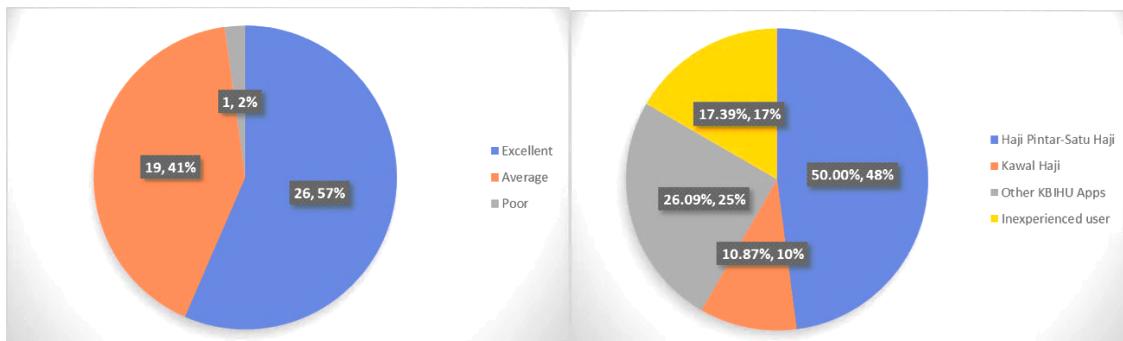


Figure 6. Proficiency of use at KBIHU Ahmad Dahlan. High levels of smartphone proficiency among participants indicate readiness for mobile learning, though some users still require technical assistance.

Regarding which applications were used, 50% reported using Haji Pintar – Satu Haji, making it the most widely adopted platform. Meanwhile, 26.1% used the local KBIHU-developed app, and 10.9% used Kawal Haji. Another 19.6% had never used any mobile Hajj application, indicating a digital access gap. The prominence of Haji Pintar, an official app endorsed by the Ministry of Religious Affairs, reflects its broader availability and public awareness. The popularity of the KBIHU-developed app also illustrates the relevance of local, context-sensitive educational tools.

3.4. Frequency and Depth of Engagement

Although initial access to mobile apps was high, as illustrated in [Figure 7](#), frequent use remained limited, as illustrated in [Figure 7](#), 47.8% of respondents reported rare usage (score 1), while 34.8% reported moderate use (score 3). Only 6.5% used the applications regularly (scores 4 and 5). This suggests that the applications were more exploratory tools than embedded learning systems. Barriers to continued use may include limited time, lack of motivation, or insufficient familiarity with the app features. These findings highlight the need for ongoing support, such as reminders, refresher modules, or interactive incentives, to maintain user engagement.

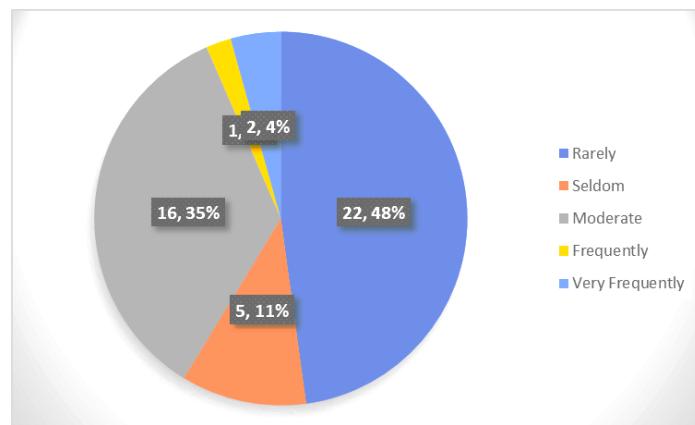


Figure 7. Respondents' engagement with mobile Hajj applications by usage frequency. Low usage frequency indicates the need for improved motivation and support to embed mobile apps into routine Hajj preparation.

3.5. Preferred Features and Pedagogical Impact

Respondents indicated the most frequently used features, as shown in [Figure 8](#), were ritual video guides (34.8%), followed by ritual simulations (21.7%), maps of key locations in Mecca and Medina (17.4%), interactive quizzes (15.2%), and real-time consultation (10.9%). Other features, such as voice commands and search tools, were accessed by less than 7% of users. The dominance of video and simulation features reinforces the value of visual and practical learning formats in religious instruction. Quizzes and Q&A tools, although less frequently used, represent interactive possibilities that can be further developed and enhanced.

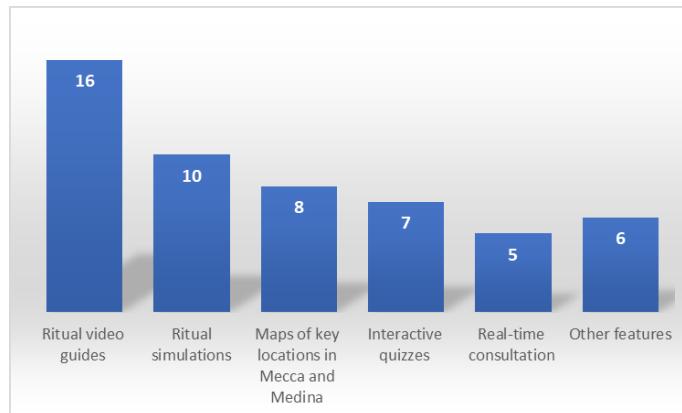


Figure 8. Most frequently used features of mobile Hajj applications by respondents. Participants favored video-based and simulation content, emphasizing a preference for visual, hands-on learning formats.

When asked about the applications' effectiveness in improving their ritual understanding, 28.3% rated them as "very helpful," and 19.6% as "helpful." Another 37% rated the apps as moderately helpful, while only 15.2% rated them poorly. This distribution suggests that mobile learning is generally perceived as beneficial, particularly when it incorporates visual and interactive elements.

3.6. Confidence and Emotional Readiness

Participants also expressed that the apps contributed to their emotional readiness. About 32.6% selected a score of 3 (moderately helpful), and the same percentage scored 4 (useful), while 26.1% felt that the apps were "beneficial" in reducing anxiety over making ritual mistakes. Only 8.7% expressed negative views. These results suggest that mobile tools help not only cognitively but also psychologically, by increasing confidence and reducing hesitation. However, the large number of mid-range responses also indicates room for improvement in the emotional assurance these apps provide.

Confidence levels after using the applications were similarly distributed. 43.5% reported moderate confidence (score 3), while 26.1% felt confident (score 4), and 21.7% very confident (score 5). Only 8.6% felt unsure. While this indicates a positive trend, the high proportion of moderate responses suggests that digital tools, on their own, may not be sufficient to replace face-to-face spiritual mentoring fully. This aligns with previous findings by Probosuseno et al. (2022) [\[12\]](#), which emphasized that structured digital training

significantly reduces anxiety among elderly pilgrims.

Based on participants' feedback and survey responses, it appears that mobile applications do more than merely supplement traditional Hajj education; for many users, they serve as a primary learning source. However, their effectiveness varies depending on user engagement, prior knowledge, and support structures. While the applications significantly enhance ritual comprehension for tech-savvy users, they are more supplementary for less digitally literate individuals. This duality suggests that mobile apps should be positioned both as core tools and complementary aids within a blended Hajj education framework.

Moreover, user trust in mobile platforms plays a critical role in determining engagement levels, especially during sensitive contexts such as Hajj. As highlighted by IEEE study on smart digital healthcare, digital services deployed during Hajj face not only technological but also privacy-related challenges [24]. The study underscores that even official applications like *Sehhaty* may lack adequate personalization or privacy control, which can limit user confidence. Similarly, religious mobile apps must be designed with user-centric privacy considerations and clear guidance to ensure sustainable adoption. This insight reinforces the importance of including localized preferences and safeguarding user data in religious education apps to foster broader and deeper engagement.

3.7. Technical Challenges and Access Barriers

Technical and functional limitations were frequently reported, as illustrated in [Figure 9](#). The most common complaints (32.6%) were the lack of live guidance, followed by small font sizes (28.3%), and unstable internet connections (26.1%). Other reported barriers included insufficient features (13%), operational difficulties (6.5%), and language interfaces that were difficult to understand (4.3%). These findings underscore the need for more inclusive design, particularly for older users and those residing in areas with limited connectivity.

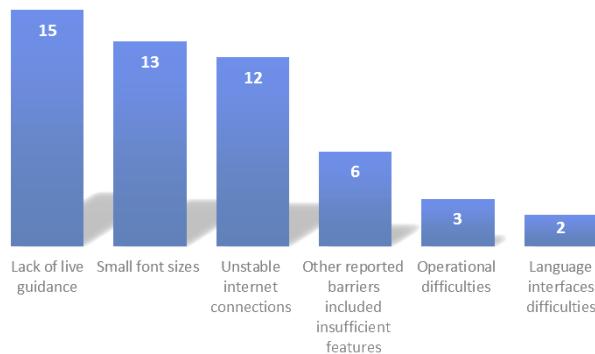


Figure 9. Report of technical and functional limitations. Design and accessibility issues remain key challenges in ensuring inclusive and effective mobile-based Hajj education.

A total of 69.6% of participants requested offline access. This reflects not only a preference but also a necessity for pilgrims who may travel to areas with limited infrastructure. Offline content delivery, larger fonts, intuitive navigation, and multilingual options—especially in Arabic, English, and local languages such as Javanese or Sundanese—were among the most requested enhancements. These suggestions highlight the importance of culturally and technologically inclusive mobile education solutions.

3.8. User Feedback and Future Development

Respondents strongly emphasized ease of use and accessibility in their feedback. Key suggestions included simplified interfaces, larger text options, structured onboarding guides, and expanded video content. Additional content requests included daily spiritual materials such as supplications (dzikir), moral advice, and prohibited actions during pilgrimage. Safety features such as location sharing, emergency contacts, and SOS buttons were also suggested.

Notably, several users noted that while the applications were beneficial, broader awareness was still lacking. Promotion through official KBIHU channels, social media, and collaboration with the Ministry of Religious Affairs was recommended to improve app reach and user onboarding. These insights underscore the importance of strategic dissemination in conjunction with technological development.

In line with recent developments in digital service personalization, the integration of social media sentiment and real-time user input can be an effective strategy to enhance future mobile Hajj applications. A recent IEEE study proposed a predictive deep learning model to classify social media posts during Hajj and

Umrah into categories such as rituals, safety, services, and well-being, achieving high-accuracy results through natural language processing and supervised learning techniques [25]. This approach enables service providers to identify common concerns and optimize user experience based on collective feedback. By incorporating similar predictive analytics into religious mobile platforms, app developers and KBIHU institutions can better understand user needs and deliver more responsive, targeted support systems for pilgrims.

4. CONCLUSION

This community engagement initiative has demonstrated the effectiveness of mobile Hajj applications—such as Hajji Pintar-Satu Haji and Kawal Haji—in supporting digital religious education and improving ritual understanding among pilgrims. Through mobile-based tutorials, WhatsApp mentoring, and digital feedback, the program successfully reached a diverse group of prospective pilgrims at KBIHU Ahmad Dahlan, with strong engagement supported by local facilitators. The findings confirm that visual, self-paced, and context-sensitive features in mobile apps are well-received and effective for religious learning. However, challenges remain in sustaining consistent usage, particularly among elderly users and those with limited digital literacy. Addressing these gaps requires enhancements such as offline accessibility, intuitive interfaces, and targeted mentoring. Other KBIHU institutions across Indonesia can replicate this model. Strengthening the program through collaboration with developers and policy stakeholders will enable wider dissemination and a longer-term impact. Ultimately, mobile religious learning tools can serve as strategic instruments for inclusive digital transformation within faith-based communities.

REFERENCES

- [1] Q. Huda and I. D. Haeba, "Hajj, Istītā'ah, and Waiting List Regulation in Indonesia," *Al-'Adalah*, vol. 18, 2021, doi: [10.24042/al-'adalah.v18i2.9903](https://doi.org/10.24042/al-'adalah.v18i2.9903)
- [2] Nurhalida HS and M. F. Isbah, "Hajj and Hajj Attire for Bugis Women: A Phenomenological Study in Bone District, South Sulawesi, Indonesia," *DINIKA : Academic Journal of Islamic Studies*, vol. 8, no. 1, pp. 44–68, Jun. 2023, doi: [10.22515/dinika.v8i1.7484](https://doi.org/10.22515/dinika.v8i1.7484)
- [3] Abdullah Haidar and Siti Annisa Satifa, "Bibliometric Analysis of Publication Paper Themes for Hajj Services over the Period of COVID-19 Pandemic," *Milkiyah: Jurnal Hukum Ekonomi Syariah*, vol. 2, no. 2, pp. 85–94, Aug. 2023, doi: [10.46870/milkiyah.v2i2.440](https://doi.org/10.46870/milkiyah.v2i2.440)
- [4] Y. Adwimurti, S. Selfiani, and K. Dewi, "Improving the Community's Understanding about the Implementation of the Manasic of Hajj and Umrah in the New Normal Era," *ICCD*, vol. 4, no. 1, Dec. 2022, doi: [10.33068/iccd.v4i1.536](https://doi.org/10.33068/iccd.v4i1.536)
- [5] A. Owaiddah, D. Olaru, M. Bennamoun, F. Sohel, and N. Khan, "Transport of pilgrims during Hajj: Evidence from a discrete event simulation study," *PLoS One*, vol. 18, no. 6 June, Jun. 2023, doi: [10.1371/journal.pone.0286460](https://doi.org/10.1371/journal.pone.0286460)
- [6] A. Quaium *et al.*, "Towards associating negative experiences and recommendations reported by Hajj pilgrims in a mass-scale survey," *Helijon*, vol. 9, no. 5, May 2023, doi: [10.1016/j.helijon.2023.e15486](https://doi.org/10.1016/j.helijon.2023.e15486)
- [7] R. N. Ismail and A. P. Astutik, "Development of Canva Based Interactive Multimedia Teaching Materials on Fiqih Material for the Hajj and Umrah Worship," *Literatus*, vol. 6, no. 1, pp. 97–108, Jun. 2024, doi: [10.37010/lit.v6i1.1552](https://doi.org/10.37010/lit.v6i1.1552)
- [8] W. Ruwiah, "The Influence of Jama'ah Trust and Company Image on the Satisfaction of Jama'ah Umrah Hajj Travel Arminareka," *Indonesian Journal of Multidisciplinary Science*, 2023.
- [9] N. Setiawan and N. Soewarno, "Protection of Hajj and Umrah Pilgrims from Fraud: Evidence from Indonesia," *Share: Jurnal Ekonomi dan Keuangan Islam*, vol. 13, no. 1, p. 276, Feb. 2024, doi: [10.22373/share.v13i1.22865](https://doi.org/10.22373/share.v13i1.22865)
- [10] E. A. Khan and M. K. Y. Shambour, "An analytical study of mobile applications for Hajj and Umrah services," Jan. 01, 2018, *Elsevier B.V.* doi: [10.1016/j.aci.2017.05.004](https://doi.org/10.1016/j.aci.2017.05.004)
- [11] A. J. Showail, "Solving Hajj and Umrah Challenges Using Information and Communication Technology: A Survey," *IEEE Access*, vol. 10, pp. 75404–75427, 2022, doi: [10.1109/ACCESS.2022.3190853](https://doi.org/10.1109/ACCESS.2022.3190853)
- [12] Probosuseno, Fidiansjah, W. Rochmah, and A. G. Mukti, "Innovative education training program of hajj healthcare workers improves the outcomes of Indonesian elderly hajj pilgrims," *Cakrawala Pendidikan*, vol. 41, no. 2, pp. 365–376, Jun. 2022, doi: [10.21831/cp.v41i2.47490](https://doi.org/10.21831/cp.v41i2.47490)
- [13] A. N. Maram, I. G. Said, and T. T. Tutik, "Fatwā on The Ruling of Hajj Without Taṣrīh; The Case of Indonesian Hajj Pilgrims in 2024," *AL-IHKAM: Jurnal Hukum & Pranata Sosial*, vol. 19, no. 2, pp. 413–443, Dec. 2024, doi: [10.19105/al-lhkam.v19i2.15437](https://doi.org/10.19105/al-lhkam.v19i2.15437)

- [14] A. Asrin, "Integration of Islamic Educational Values in the Practice of Hajj Worship (Spiritual Experience of Hajj Trip in 1444H/2023M)," *Pusat Studi Aswaja Unisnu Jepara JASNA*, vol. 5, no. 1, 2025.
- [15] R. Alfian and F. Rafianti, "Problems Of The Implementation Of Hajj And Umrah (Study Of Law Number 8 Of 2019 Concerning The Implementation Of Hajj And Umrah)," *International Journal of Management, Economic and Accounting*, vol. 1, 2023, doi: [10.61306/ijmea](https://doi.org/10.61306/ijmea)
- [16] E. A. Felemban *et al.*, "Digital Revolution for Hajj Crowd Management: A Technology Survey," *IEEE Access*, vol. 8, pp. 208583–208609, 2020, doi: [10.1109/ACCESS.2020.3037396](https://doi.org/10.1109/ACCESS.2020.3037396)
- [17] M. Binsawad and M. Albahar, "A Technology Survey on IoT Applications Serving Umrah and Hajj," *Applied Computational Intelligence and Soft Computing*, vol. 2022, no. 1, p. 1919152, Jan. 2022, doi: [10.1155/2022/1919152](https://doi.org/10.1155/2022/1919152)
- [18] A. Bramayudha and A. Irawan, "Hajj and Umrah during Pandemic Covid-19: The Case of Indonesia," *International Journal of Islamicate Social Studies*, vol. 1, no. 1, pp. 13–21, May 2023, doi: [10.62039/ijiss.v1i1.12](https://doi.org/10.62039/ijiss.v1i1.12)
- [19] H. M. Alghamdi and A. Mostafa, "Towards Reliable Healthcare LLM Agents: A Case Study for Pilgrims during Hajj," *Information*, vol. 15, no. 7, 2024, doi: [10.3390/info15070371](https://doi.org/10.3390/info15070371)
- [20] M. K. Shambour and A. Gutub, "Personal Privacy Evaluation of Smart Devices Applications Serving Hajj and Umrah Rituals," *Journal of Engineering Research (Kuwait)*, vol. 11, no. 2, pp. 1–14, Jun. 2023, doi: [10.36909/jer.13199](https://doi.org/10.36909/jer.13199)
- [21] F. Gazzawe and M. Albahar, "Reducing traffic congestion in makkah during Hajj through the use of AI technology," *Heliyon*, vol. 10, no. 1, Jan. 2024, doi: [10.1016/j.heliyon.2023.e23304](https://doi.org/10.1016/j.heliyon.2023.e23304)
- [22] A. Albalawi, E. J. Aljohani, E. Y. Alqulaity, H. M. Almukhalfi, and W. M. S. Yafooz, "An analytical Study of Mobile Applications Recommended by The Ministry of Hajj and Umrah," in *2023 3rd International Conference on Computing and Information Technology (ICCIT)*, 2023, pp. 605–610. doi: [10.1109/ICCIT58132.2023.10273907](https://doi.org/10.1109/ICCIT58132.2023.10273907)
- [23] Z. Abidin, A. Dwijayanto, and A. M. Dali, "Existence and Dynamics of Hajj and Umrah Guidance Groups in Bogor and Jember Regency," *Jurnal SMART (Studi Masyarakat, Religi, dan Tradisi)*, vol. 9, no. 2, pp. 273–287, Dec. 2023, doi: [10.18784/smart.v9i2.1998](https://doi.org/10.18784/smart.v9i2.1998)
- [24] A. Alhazmi, "Privacy in Smart Digital Healthcare During Hajj and Umrah: Challenges and Recommendations," in *2025 2nd International Conference on Advanced Innovations in Smart Cities (ICAISC)*, 2025, pp. 1–7. doi: [10.1109/ICAISC64594.2025.10959406](https://doi.org/10.1109/ICAISC64594.2025.10959406)
- [25] S. A. Chelloug *et al.*, "Enhancing Hajj and Umrah Services Through Predictive Social Media Classification," *IEEE Access*, vol. 13, pp. 67220–67238, 2025, doi: [10.1109/ACCESS.2025.3559204](https://doi.org/10.1109/ACCESS.2025.3559204)