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Augmented Reality Adoption Readiness in Islamic Education
(A Comparative Study in MI Al Huda Kebonsari, Indonesia and Chariyathamsuksa School, Thailand)

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ABSTRACT

The integration of immersive technologies such as Augmented Reality (AR) presents unique opportunities and challenges for Islamic educational institutions. This research aims to fill this gap by conducting a multi-dimensional comparative analysis of AR adoption readiness at two Islamic educational institutions in Southeast Asia: MI Al Huda Kebonsari, Indonesia, and Chariyathamsuksa Foundation School, Thailand. Using a qualitative comparative case study approach, this study analyzes data from in-depth interviews, observations, and document analysis through a multi-layered analytical framework comprising the Education Technology Readiness Index (ETRI) for institutional capacity (macro), the Unified Theory of Acceptance and Use of Technology (UTAUT) for behavioral drivers (meso), and the Technology Readiness Index (TRI) for psychological dispositions (micro). The results reveal two distinct readiness profiles: MI Al Huda demonstrates a "policy-driven" readiness, characterized by a strong managerial vision but hampered by infrastructural resource limitations. Conversely, Chariyathamsuksa exhibits an "opportunity-driven" readiness, excelling in material resources due to external partnerships but facing challenges in institutionalizing innovation for long-term sustainability. This study concludes that true technological readiness is a complex socio-technical phenomenon, requiring simultaneous attention to infrastructure, perception, and mindset to ensure that technology is not only adopted but also wisely integrated to strengthen the core mission of Islamic education in shaping a generation of noble character.

Keywords : Augmented Reality, Islamic Education, Technology Adoption Readiness, Comparative Study, ETRI, UTAUT, TRI

ABSTRAK

Integrasi teknologi imersif seperti Augmented Reality (AR) menghadirkan peluang dan tantangan yang unik bagi lembaga pendidikan Islam. Penelitian ini bertujuan untuk mengisi kesenjangan tersebut melalui analisis komparatif multi-dimensi terhadap tingkat kesiapan adopsi AR di dua lembaga pendidikan Islam di Asia Tenggara: MI Al Huda Kebonsari, Indonesia, dan Chariyathamsuksa Foundation School, Thailand. Dengan menggunakan pendekatan studi kasus komparatif kualitatif, penelitian ini menganalisis data yang diperoleh melalui wawancara mendalam, observasi, dan analisis dokumen menggunakan kerangka analisis berlapis yang terdiri atas: Education Technology Readiness Index (ETRI) untuk mengukur kapasitas kelembagaan (tingkat makro), Unified Theory of Acceptance and Use of Technology (UTAUT) untuk menilai faktor pendorong perilaku (tingkat meso), serta Technology Readiness Index (TRI) untuk menelaah kecenderungan psikologis individu (tingkat mikro). Hasil penelitian menunjukkan adanya dua profil kesiapan yang berbeda. MI Al Huda menampilkan tipe kesiapan "berbasis kebijakan", yang ditandai oleh visi manajerial yang kuat namun terhambat oleh keterbatasan sumber daya infrastruktur. Sebaliknya, Chariyathamsuksa menunjukkan tipe kesiapan "berbasis peluang", dengan keunggulan pada ketersediaan sumber daya material berkat kemitraan eksternal, tetapi menghadapi tantangan dalam menginstitusionalisasi inovasi untuk keberlanjutan jangka panjang. Penelitian ini menyimpulkan bahwa kesiapan teknologi yang sejati merupakan fenomena sosio-teknis yang kompleks, yang memerlukan perhatian simultan terhadap infrastruktur, persepsi, dan pola pikir. Hal ini penting agar teknologi tidak hanya diadopsi, tetapi juga diintegrasikan secara bijak guna memperkuat misi inti pendidikan Islam dalam membentuk generasi berkarakter mulia.

Kata Kunci : *Augmented Reality*, Pendidikan Islam, Kesiapan Adopsi Teknologi, Studi Komparatif, ETRI, UTAUT, TRI

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INTRODUCTION

The world of global education is entering a period of profound transformation, driven by the integration of digital sophistication. This shift, which has accelerated post-Covid-19, has moved technology from a peripheral interest to a central focus of academic and practical inquiry (Cufuna et al., 2025). Among the available technologies, Augmented Reality (AR) stands out for its ability to display interactive virtual content over the physical world, accessible through common devices like smartphones and tablets. The potential of AR to transform student engagement and deepen material comprehension has been well-documented, offering immersive 3D visualizations to make abstract concepts tangible and learning more dynamic (Gomez et al., 2022).

This global technological momentum presents a unique set of opportunities and challenges for Islamic education systems, especially in Southeast Asia. Indonesia, through its Kurikulum Merdeka (Merdeka Curriculum) policy, explicitly encourages active student engagement and personalized educational pathways (UNESCO, 2023). On the other hand, Islamic educational institutions in Southern Thailand are also continually innovating, often by leveraging international partnerships to enhance their educational offerings. The adoption of technology in these diverse settings is not a uniform process but is shaped by differing national policies, institutional missions, and local community needs.

In the context of Islamic education, the main challenge is not merely technical adoption but the wise and meaningful integration of technology to support a holistic educational mission (Siregar et al., 2025). This integration must ensure that technology serves as a vehicle to strengthen character, cultivate noble morals (*akhlāq*), and deepen students' faith, rather than simply digitizing traditional content. This requires a careful triangulation between technological affordability, Islamic pedagogical goals, and the socio-cultural context of the local community.

Previous research by Lateh et al. (2025) also highlights how the broader digital transformation in Islamic educational institutions in Indonesia and Southern Thailand faces distinct challenges related to policy, infrastructure, and culture. Therefore, the need for a study that specifically examines the readiness for adopting immersive technologies in these environments is crucial.

A large body of scholarly work has established a clear consensus on the opportunities and constraints of AR in educational settings. The most frequently cited benefits are significant increases in student motivation and engagement (Kazlaris et al., 2025; Quintero et al., 2019). AR's ability to present complex concepts in interactive 3D visualizations has been shown to improve conceptual understanding (Sigh et al., 2024) and foster the development of 21st-century skills such as collaboration and problem-solving (Gomez et al., 2022). However, the literature is equally clear about the significant challenges, ranging from technical complexities like software instability to the digital divide that hinders equitable implementation (Suraijiah et al., 2023). Beyond technical aspects, pedagogical challenges are paramount, with many AR implementations suffering from a lack of structured instructional design and risking cognitive overload for students (Kazlaris et al., 2025).

Furthermore, the success of AR integration is critically dependent on the human factor, particularly the readiness of teachers. A systematic literature review reveals that even with sophisticated technology, the absence of a strong pedagogical framework can render AR ineffective (Kazlaris et al., 2025). Teacher readiness is not merely about technical skill, but also encompasses their attitudes and beliefs towards the technology's role in the classroom (Ewais et al., 2025). Studies assessing teachers' readiness for AR often highlight the need for targeted professional development that moves beyond basic operation to focus on designing

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meaningful, curriculum-aligned learning experiences. Without this pedagogical readiness, AR risks being used as a mere novelty rather than a transformative educational tool.

These challenges are often amplified in the context of developing countries and specific educational systems like Islamic education. Reports from international bodies confirm that infrastructure gaps and digital divides remain significant barriers to technology adoption across Southeast Asia (UNESCO, 2023). Adoption models developed for Western contexts often fail to account for the unique socio-cultural and economic realities in developing nations (Sabiteka et al., 2025). Within Islamic educational institutions, these challenges are further compounded by the need to align technological innovations with core spiritual and ethical values, a domain where specific policy frameworks and best practices are still emerging (Salim & Aditya, 2025; Sholeh, 2023).

The existing body of scientific literature presents a bifurcated landscape. On one hand, studies on the implementation of Augmented Reality (AR) in education have become an extensively explored field, with bibliometric analyses confirming a sharp increase in publications since 2021 (Singh et al., 2024). On the other hand, research focusing on technology integration within the context of Islamic education also shows significant vitality (Sanzi & Kurniawan, 2025). However, a significant research gap emerges at the intersection of these two domains. A systematic search of academic databases reveals that publications specifically examining "Augmented Reality in Islamic Education" are drastically scarce.

This gap is twofold. First, it is thematic: existing studies are fragmented, focusing either on the technical effectiveness of AR in secular contexts or on general digital transformation in Islamic institutions without specifically addressing immersive technologies. Second, it is geographical and contextual: the vast majority of AR literature originates from developed countries and secular contexts (Singh et al., 2024), leaving the unique pedagogical traditions and values of Islamic educational institutions in Southeast Asia largely unexplored. This study directly fills this dual void. By conducting a cross-national comparative analysis using a multi-layered framework, this research offers a novel contribution by providing a nuanced, context-specific understanding of AR adoption readiness in a domain that has, until now, remained at the periphery of scholarly inquiry.

This paper aims to address the shortcomings of previous studies that have not comprehensively and multi-dimensionally examined the readiness for Augmented Reality (AR) adoption in Islamic educational institutions. Existing studies tend to be fragmented: one side focuses on the technical effectiveness of AR in secular contexts, while the other discusses digital transformation in Islamic institutions in general without touching on immersive technologies specifically. Consequently, the understanding of readiness for adopting advanced technologies like AR remains sporadic and partial, meaning there has been no consistent articulation of the success factors that encompass institutional, behavioral, and psychological aspects. Through this paper, an analysis of technology readiness from two different countries is formulated in an effort to build a more holistic understanding of AR adoption in the Islamic education environment.

This report is positioned to make a new contribution by bridging two different research streams while addressing the weaknesses of previous research. Most of the scientific literature, as reviewed by Singh et al. (2025), tends to focus on the use of Augmented Reality in secular education contexts in developed countries. As a result, criticism has emerged that the scope of existing studies has not yet reached the unique context of Southeast Asia. This leaves a significant research gap, especially when linked to Islamic educational institutions that have distinctive pedagogical traditions and values. This study directly fills this dual gap—both geographically and thematically—and its action is aligned with the scientific trend of exploring AR applications in new and diverse domains (Kazlaris et al., 2025). By conducting a direct

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comparative case study on two institutions with different strategic profiles and resource levels, this research moves beyond broad generalizations to offer nuanced and context-specific insights.

Therefore, the significance of this study extends beyond a mere descriptive account. Theoretically, it contributes by applying and validating a synthesized multi-layered analytical framework (ETRI, UTAUT, TRI) in the unique context of Islamic education, a domain rarely explored by such comprehensive readiness models. Practically, the findings offer a nuanced diagnostic roadmap for school leaders, policymakers, and educational foundations in Southeast Asia and other developing regions, enabling them to formulate context-specific strategies for technology adoption that balance infrastructural investment with human-centered development. Globally, this research fills a critical geographical and thematic gap in the literature on immersive technologies. By shifting the focus from the well-documented secular contexts of developed nations to the under-researched Islamic educational landscape, this study enriches the international discourse on how advanced technology can be wisely integrated to support holistic educational missions without compromising local values and spiritual traditions.

RESEARCH METHOD

This study uses a qualitative approach with a comparative study design to analyze the readiness for Augmented Reality adoption at MI Al Huda Kebonsari and Chariyathamsuksa Foundation School, Thailand. The qualitative approach was chosen because it allows for a deep understanding of the complex phenomenon of technology readiness in its unique, natural context. A comparative study design was used to identify similarities and differences in capacities, challenges, and strategies related to AR implementation in the two institutions, which have different cultural and policy backgrounds.

The research locations, MI Al Huda Kebonsari in Indonesia and Chariyathamsuksa Foundation School in Thailand, were selected purposively to represent two contrasting archetypes of Islamic educational institutions. MI Al Huda was chosen as a case of a 'policy-driven' institution, which operates within a strong national policy framework (Kurikulum Merdeka) that encourages top-down innovation but faces significant resource limitations. In diametric contrast, Chariyathamsuksa Foundation School was selected as a case of an 'opportunity-driven' institution, which excels in material resources due to external partnerships but faces challenges in institutionalizing innovation for long-term sustainability. This stark contrast between a policy-driven, resource-constrained model and an opportunity-driven, resource-rich model provides a robust basis for a comparative analysis to identify the different factors, challenges, and strategic pathways toward technology adoption readiness.

Data for this analysis were collected from various sources, including key informants such as institutional leaders, educators, and administrative staff, selected purposively based on their roles in technology planning and implementation at their respective institutions. Data collection techniques included in-depth interviews to explore perceptions and strategies, direct observation of existing technology use, and analysis of policy documents and strategic plans related to digitalization and educational innovation.

Data analysis was conducted descriptively and qualitatively through three main stages. First, data reduction was performed by filtering and focusing on the most relevant information related to the pillars of technology readiness. Second, the data were presented in a structured narrative form, organized according to a multi-layered analytical framework (ETRI, UTAUT, and TRI) to facilitate comparison. Third, conclusions were drawn to identify patterns, differences, and determining factors of AR readiness in both locations. To maintain data

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validity, source and method triangulation was used by comparing information from interviews, observations, and documents to ensure accurate and consistent findings.

RESULTS AND DISCUSSION

The analysis of technology adoption readiness in this study is grounded in a concrete pedagogical challenge within Islamic education. Subjects such as *fiqh* (Islamic jurisprudence), particularly in chapters on worship practices like *Salat* (prayer), and *Sirah Nabawiyah* (the Prophet's life) often involve abstract concepts, complex procedural steps, or historical settings that are difficult for students to visualize through textbooks alone. This challenge often leads to rote memorization rather than deep conceptual understanding. Augmented Reality (AR) is proposed here as a potential solution to this specific problem, offering an immersive and interactive way to make these abstract concepts tangible. Therefore, the following discussion of institutional readiness at MI Al Huda and Chariyathamsuksa is not merely a technical assessment, but an exploration of their capacity to adopt a technology aimed at solving a core learning challenge in Islamic Religious Education (PAI).

A. Profile of MI Al Huda Kebonsari

MI Al Huda Kebonsari is a private Islamic elementary school (Madrasah Ibtidaiyah) located in a rural area, specifically in Kebonsari Village, Purwodadi District, Purworejo Regency, Central Java. As an educational institution under the auspices of the Nahdlatul Ulama (NU) Ma'arif Education Institute, the school has strong roots in the local community and serves the surrounding population. This context places MI Al Huda in a dynamic of rapid transformation. On one hand, the Indonesian government, through policies like the Kurikulum Merdeka, encourages a student-centered learning approach and personalized education—a goal that often requires technological support. Furthermore, at the regional level, there are broader digitalization initiatives, such as the "Purworejo Smart Digital" program and the implementation of the centralized "Madrasah Digital Report" (Rapor Digital Madrasah - RDM) portal, which demand active participation from all madrasahs.

On the other hand, the reality at the institutional level shows a significant leap in progress. According to recent research findings, since 2022, MI Al Huda has experienced a substantial improvement in its technological facilities and infrastructure. This includes the construction of a new multimedia building, the availability of adequate computers and laptops for the school's needs, and the installation of a reliable 5G internet network with a 50mbps bandwidth. A strong push from the ministry to implement digital integration across all education sectors has also led to a significant surge in this madrasah. This development has drastically changed the school's technological posture, from being previously limited to an institution that now possesses a strong digital infrastructure foundation. This creates a new alignment between the top-down digitalization policy mandate and the bottom-up implementation capacity at the grassroots level, enabling MI Al Huda Kebonsari to actively participate in the digital education ecosystem.

B. Profile Chariyathamsuksa Foundation School

In diametric contrast, Chariyathamsuksa Foundation School is a large, well-established private Islamic educational institution in Songkhla Province, Southern Thailand. The school provides education from kindergarten to secondary levels, serving a large and diverse student population of 2,405 students across 67 classrooms. Operating within the unique socio-political context of Southern Thailand, where Islamic educational institutions play a crucial role in community identity, Chariyathamsuksa has strategically positioned itself.

Technology readiness at Chariyathamsuksa is not solely driven by external pressures but by a clear internal strategic intent. The school's vision is explicitly "to be a leader in

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academics, adhering to virtues, and coordinating with the community," with a mission to produce students knowledgeable in both religious and general sciences. Crucially, the school's strategic documents clearly target the development of 21st-century skills, students' ability to create innovations, and the creative use of technology. Thus, technology adoption is not merely a reactive response but a proactive step to achieve its institutional vision and mission. The growing trend of collaboration between Islamic schools in the region and universities, both local and international from Indonesia, to enhance teacher capacity and drive digital transformation further strengthens this strategic position.

C. Macro-Level Analysis: The Institutional Ecosystem Using the Education Technology Readiness Index (ETRI)

The analysis at the macro level aims to evaluate and compare the objective institutional capacities of MI Al Huda and Chariyathamsuksa. Using the six pillars of the World Bank's Education Technology Readiness Index (ETRI), this evaluation provides a foundational overview of the resources, policies, and human capabilities that both institutions possess to support the implementation of AR technology.

a. Pillar 1: School Management and Leadership Vision

This pillar examines the extent to which school leadership has a clear vision for technology integration and whether this vision is supported by policies and strategic planning. Here, the differences between the two institutions become apparent, especially due to the influence of different national policy contexts.

The analysis for MI Al Huda is based on a review of the school's annual curriculum documentation, which contains its vision, mission, work programs, and inventory lists. MI Al Huda operates under Indonesia's Kurikulum Merdeka policy. This policy explicitly encourages school autonomy, active student engagement, and pedagogical innovation. This national mandate provides a strong foundation for MI Al Huda's leadership to formulate a pro-technology vision. However, the challenge lies in translating this broad national mandate into a concrete and implementable strategic plan at the school level.

On the other hand, the data regarding Chariyathamsuksa in Southern Thailand were obtained through field observations and in-depth interviews. This institution appears to have a more bottom-up or opportunity-driven approach. Their innovations are often motivated by "international partnerships." This means their technology vision may not be embedded in a uniform national policy but develops organically through specific projects funded or supported by external partners.

b. Pillar 2: Teachers (Capacity and Professional Development)

The assessment of teacher readiness within this pillar is derived from a triangulation of data, including learning observations, classroom documentation, and in-depth interviews with educators. Teacher readiness is the most critical determinant of success. This pillar assesses not only the technical skills of teachers but also their access to effective professional development programs. This analysis will evaluate whether the training programs at both institutions are pedagogically transformative or merely instrumental

Teacher readiness at MI Al Huda demonstrates a strong institutional commitment and comprehensive participation. Findings show that all teachers and staff at the madrasah actively participate in various training and workshops focused on the use of technology in education. This training is not only theoretical but also practical, covering the use of educational applications and interactive teaching tools like Kahoot,

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Wordwall, and AR-based platforms. The active involvement of all staff indicates that professional development is no longer an issue of equity but has become an institutionalized culture in the madrasah, in line with the spirit of pedagogical innovation from the Kurikulum Merdeka.

The capacity of teachers at Chariyathamsuksa is significantly strengthened by the school's institutional role as a regional academic hub. Findings indicate that the school regularly hosts international events, such as the International Academic Festival (IAF). This role as an organizer creates a dynamic and demanding environment, which indirectly serves as a form of continuous professional development. Teachers not only gain access to training through international partnerships but are also directly involved in academic exchanges and global competitions. This involvement fosters a "spirit of growth" and encourages educators to continuously innovate to align with the school's international reputation. The challenge remains in translating this international exposure into daily pedagogical practices that are relevant to the local context.

c. Pillar 3: Students (Skills and Accessibility)

The analysis for this third pillar is primarily drawn from in-depth interviews with students from both institutions. This pillar assesses readiness from the end-users' perspective: the students. It includes their level of digital literacy as well as issues of accessibility and equity. Successful technology implementation must ensure that all students can participate and benefit.

In both Indonesia and Thailand, smartphone penetration among the youth is quite high, which theoretically provides a basic platform for AR. However, this assumption needs to be tested. The analysis needs to delve deeper into potential digital divides. Do all students have compatible devices? Are there differences in access between students from different socio-economic backgrounds? As mentioned in the literature, the digital divide is a serious barrier to equitable implementation. Institutions must have strategies to address this gap, such as providing school-owned devices or designing activities that do not entirely depend on personal device ownership.

d. Pillar 4 & 5: Device Infrastructure and Connectivity

The data for these foundational pillars were gathered through direct field observations of each school's facilities and interviews with administrative staff. These are the most fundamental pillars of readiness and often the first and greatest obstacles. Without adequate devices and reliable internet connectivity, all visions and strategic plans will be futile.

MI Al Huda Kebonsari presents a paradoxical infrastructure profile. On one hand, the school has a strong connectivity foundation. The available internet network is reliable with a symmetrical speed (1:1 upload and download) of 50 Mbps, which is very adequate to support various digital education activities. Additionally, classrooms equipped for multimedia create a conducive environment for student exploration. However, on the other hand, there is a significant gap in device availability. With only one computer lab containing 20 units to serve a total of 144 students, the device-to-student ratio is still very small. This limitation creates serious logistical hurdles, where lab use must be scheduled strictly and meticulously, thus hampering the flexibility and accessibility of digital-based learning.

Chariyathamsuksa, in line with its strategic focus and international partnerships, demonstrates more mature infrastructure readiness. Although facing similar challenges in ensuring uniform connectivity quality, the school has taken the crucial step of

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providing a tablet for every student. This 1:1 ratio model fundamentally changes the accessibility landscape, removing the main barrier faced by MI Al Huda. With every student having access to a personal device, the school can implement more personal, interactive, and integrated digital learning strategies without being constrained by rigid lab schedules.

e. Pilar 6: Digital Resources

The assessment for this final pillar is based on the author's landscape review of the available digital resources market. This final pillar examines the availability of relevant, high-quality digital content. A school may have the best hardware, but without appropriate software and content, the technology will be of little use. This context is particularly relevant in Indonesia, where the author's review found that the availability of AR content for Islamic education is currently very minimal, with most existing resources being premium or paid. The author's innovation in creating an AR application specifically for Fiqh lessons, particularly the chapter on Salat (prayer), prompted the need to first understand the level of institutional readiness before this technology could be effectively implemented.

This is a specific challenge for Islamic education. Most commercially available AR content is developed in a secular Western context and may not align with Islamic curricula or values. The question is: do both schools have access to a library of relevant AR content? Or do they have the capacity—both technical and financial—to develop their own content? The ability to create or adapt content represents a higher and more sustainable level of readiness. Here again, Chariyathamsuksa's partnerships could provide an advantage if their partners offer access to content creation platforms or premium content libraries. Meanwhile, MI Al Huda may need to rely on open-source resources or collaborative initiatives among teachers to build their own content repository.

Overall, this ETRI analysis is expected to reveal two different macro-readiness models. MI Al Huda's model is likely a policy-driven one, strong in managerial vision and teacher autonomy, but potentially weak in material resources. Conversely, Chariyathamsuksa's model is likely a resource-driven one, excelling in physical and digital infrastructure thanks to external support, but may face challenges in sustainability and internal policy integration.

D. Meso-Level Analysis – Behavioral Drivers of Adoption (UTAUT Framework)

After mapping the objective institutional capacity through the ETRI framework, the meso-level analysis shifts to the more subjective human dimension. Using constructs from the Unified Theory of Acceptance and Use of Technology (UTAUT), this section investigates the social and cognitive factors that influence the intention of stakeholders—especially teachers—to actually accept and use AR technology. This analysis is crucial because there is often a gap between what is available (resources) and what is adopted (behavior).

a. Performance Expectancy: Perception of Usefulness

This construct measures the degree to which an individual believes that using a system will help them attain gains in job performance. In this context, the question is: do teachers at MI Al Huda and Chariyathamsuksa truly believe that AR will make their teaching more effective and improve student learning outcomes? This perception is not formed in a vacuum. It is influenced by past experiences with technology, exposure to best practices, and the narrative built by school leadership. In-depth interviews will seek to uncover whether teachers view AR as a transformative pedagogical tool or merely as

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a visually appealing tech "gimmick" lacking educational substance. If teachers do not see a clear link between using AR and achieving learning objectives—for instance, improving students' understanding of inheritance concepts (faraid) or enriching lessons on the Prophet's life (Sirah Nabawiyah)—their intention to invest time and effort in learning it will be low, regardless of how sophisticated the technology provided is.

At MI Al Huda Kebonsari, interviews with the principal, a teacher, and a student revealed diverse perceptions. From the principal's perspective, performance expectancy is very high, extending beyond classroom benefits. He sees AR adoption as a strategic move to enhance the institution's reputation, competitiveness, and sustainability in an increasingly competitive educational landscape. From the teacher's perspective, she sees AR as a pragmatic solution to real pedagogical challenges. Her performance expectancy is high because she can clearly envision how AR can help visualize abstract concepts in Islamic Religious Education (PAI) and worship practices, which are often difficult to explain with textbooks alone. Meanwhile, from the student's viewpoint, performance expectancy is also very high. Based on positive experiences with other technologies, he anticipates that AR will make lessons considered difficult or boring more engaging, fun, and easy to understand.

Based on an analysis of the school's strategic documents and interviews with its leadership, leaders, teachers, and students at Chariyathamsuksa Foundation School demonstrate basic competencies and high expectations for Augmented Reality (AR), seeing broad opportunities. The school's vision explicitly targets the development of 21st-century skills, students' ability to innovate, and the creative use of technology, which indirectly indicates high performance expectancy from the leadership regarding AR as a strategic tool. Teachers at Chariyathamsuksa, through active participation in international events and partnerships, continuously develop themselves and have a spirit of innovation, indicating their readiness to adopt new technologies like AR. Furthermore, with tablets available for every student, device accessibility is not a barrier, giving students ample opportunity to interact with AR and are expected to have a positive performance expectancy, making learning more engaging and understandable.

b. Effort Expectancy: Perception of Ease of Use

This construct relates to the degree of ease associated with the use of the system. It is here that a sharp divergence in perception emerges at MI Al Huda, highlighting a generational and role-based gap in technology adoption. From the Teacher's perspective, her effort expectancy is low as she openly expresses concerns about the complexity of AR technology and feels unconfident in her ability to master it, which poses a significant psychological barrier. Meanwhile, from the Principal's perspective, his focus is not on personal difficulty but on "systemic effort," where he worries about the immense effort required to train the entire teaching staff and effectively integrate this new technology into an already dense curriculum. Conversely, from the Student's perspective, his effort expectancy is very high. As a digital native, he views AR technology as intuitive and "super easy," indicating that for students, the learning curve is almost non-existent.

At Chariyathamsuksa Foundation School, effort expectancy shows a positive and pragmatic outlook despite potential generational gaps. The availability of competent teaching staff, including those from abroad, significantly reduces concerns about the complexity of Augmented Reality (AR) technology. This is reinforced by the fact that AR has been successfully integrated and used for general subjects, creating a

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positive precedent and proving its ease of adaptation. Thus, the leadership and teachers at Chariyathamsuksa tend to have a lower effort expectancy, viewing the adoption of AR for Islamic Religious Education (PAI) as a manageable and sustainable step, supported by internal capacity and prior experience.

c. Social Influence: The Role of Peers and Leadership

This construct measures the degree to which an individual perceives that important others believe they should use the new system. Social influence operates on different scales for each stakeholder at MI Al Huda, yet remains a powerful factor for all. From the Teacher's perspective, social influence is micro and internal; explicit support from the principal and seeing the success of colleagues in using technology are crucial driving factors to overcome her hesitation. Meanwhile, from the Principal's perspective, his social influence is macro-oriented. His decisions are heavily influenced by demands from external stakeholders like the foundation, the government (through policies like Kurikulum Merdeka), and parental expectations, as well as the pressure to not fall behind other schools. On the other hand, from the Student's perspective, the strongest social influence comes from peers; the "fun together" factor and the desire to try what is trending among friends are primary motivators.

Based on observations of the school's international engagement and discussions with staff, social influence at Chariyathamsuksa Foundation School stems not only from the internal environment but is also heavily influenced by global trends. The school's active involvement in international events and partnerships with foreign institutions creates an environment where technology adoption, including Augmented Reality (AR), is driven by global standards and innovations. This means that leadership, teachers, and students are motivated to adopt AR because they see it as part of the latest developments in international education and to maintain the school's reputation as an academic leader that coordinates with the global community.

d. Facilitating Conditions: Perception of Support

This construct is a critical bridge between the ETRI and UTAUT analyses, measuring an individual's belief that the existing organizational and technical infrastructure is sufficient to support the use of the system. For educators at MI Al Huda, this is the most crucial determining factor. From the Teacher's perspective, this is an absolute requirement for her. Her intention to adopt AR is entirely dependent on the presence of clear facilitating conditions: structured training, reliable infrastructure (as discussed in the ETRI analysis), and standby technical support when problems arise. Meanwhile, from the Principal's perspective, this is his main focus. He immediately identifies the key variables that must be met before implementation: budget, infrastructure upgrades (especially the device ratio), and forming partnerships for technical support. On the other hand, from the Student's perspective, his needs are much simpler and more practical. For him, facilitating conditions mean two things: the availability of a device (whether personal, parental, or school-owned) and a stable internet connection.

At Chariyathamsuksa Foundation School, the facilitating conditions are highly supportive of technology adoption. Teachers have already mastered various learning technologies, including the use of Augmented Reality (AR), which indicates a high level of readiness and adaptation. Furthermore, the facilities available at the school are also adequate, ensuring that the existing organizational and technical infrastructure is sufficient to support the use of this innovative learning system.

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E. Micro-Level Analysis: Psychological Dispositions toward Technology (TRI Framework)

The micro-level analysis delves into the deepest and most personal layer of readiness: the inherent psychological dispositions of stakeholders towards technology. Using the Technology Readiness Index (TRI) framework, this section examines the traits that shape individuals' perceptions and intentions, which ultimately influence how they respond to technology initiatives. The TRI identifies four main dimensions: two drivers (Optimism and Innovativeness) and two inhibitors (Discomfort and Insecurity). This analysis is crucial because it explains why individuals within the same institutional (ETRI) and social (UTAUT) environments can exhibit vastly different levels of technology acceptance.

a. Adoption Drivers: Optimism and Innovativeness

At MI Al Huda Kebonsari, based on interview results, the principal has very high optimism, extending beyond classroom benefits. He sees AR adoption as a strategic move to enhance the institution's reputation, competitiveness, and sustainability in a competitive educational landscape. From the teacher's perspective, she views AR as a pragmatic solution to real pedagogical challenges. Her optimism is high because she can clearly envision how AR can help visualize abstract concepts in Islamic Religious Education (PAI) and worship practices, which are often difficult to explain with textbooks alone. From the student's perspective, his optimism is also very high. Based on positive experiences with other technologies, he anticipates that AR will make lessons considered difficult or boring more engaging, fun, and easy to understand. The spirit of innovation at MI Al Huda is strongly driven by the Kurikulum Merdeka policy, which encourages school autonomy and innovative pedagogy. The active involvement of all teachers and staff in various technology training and workshops, including the use of interactive applications and AR-based platforms, indicates an institutionalized culture of innovation. This aligns with the strong push from the ministry for digital integration, which has drastically changed the school's technological posture and enabled active participation in the digital education ecosystem.

For Chariyathamsuksa, the psychological dispositions under the TRI framework were not measured through a direct survey but were inferred from the qualitative data. This includes an analysis of the school's forward-thinking vision documents, observations of teachers' proactive engagement in international events, and their expressed confidence during interviews regarding technology use. At Chariyathamsuksa Foundation School, the leadership, teachers, and students also demonstrate basic competencies and high hopes for Augmented Reality (AR), seeing broad opportunities. The school's vision explicitly targets the development of 21st-century skills, students' ability to innovate, and the creative use of technology, which indirectly indicates high optimism from the leadership towards AR as a strategic tool. Teachers at Chariyathamsuksa, through active participation in international events and partnerships, continuously develop themselves and have a spirit of innovation, indicating their readiness to adopt new technologies like AR. Furthermore, with tablets available for every student, device accessibility is not a barrier, giving students ample opportunity to interact with AR and are expected to have positive optimism, making learning more engaging and understandable. Innovation at Chariyathamsuksa Foundation School is driven by internal strategic intent and international partnerships. The school's vision explicitly targets the development of 21st-century skills, students' ability to innovate, and the creative use of technology. The school's role as a host for international events like the International Academic Festival (IAF) also creates a dynamic environment that demands high standards, which indirectly serves as a form

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of continuous professional development and fosters a "spirit of growth" among educators to align with the school's international reputation.

b. Adoption Inhibitors: Discomfort and Insecurity

At the micro level, inherent psychological dispositions of stakeholders towards technology also act as adoption inhibitors, namely discomfort and insecurity. At MI Al Huda Kebonsari, discomfort is mostly seen from the teacher's perspective. Based on interview results regarding effort expectancy, the teacher openly expressed concerns about the complexity of Augmented Reality (AR) technology and felt unconfident in her ability to master it. This perception becomes a significant psychological barrier, indicating a high level of discomfort with using the new system. Meanwhile, insecurity can be inferred from the principal's focus on "systemic effort" and his need for clear facilitating conditions, such as budget, infrastructure upgrades, and partnerships for standby technical support. These concerns indicate a sense of insecurity regarding the sustainability and adequacy of technical support for AR implementation.

Conversely, at Chariyathamsuksa Foundation School, adoption inhibitors like discomfort and insecurity are estimated to be relatively low. This is supported by previous findings that effort expectancy shows a positive and pragmatic view, with the availability of competent teaching staff, including from abroad, significantly reducing concerns about the complexity of AR technology. The fact that AR has already been successfully integrated and used for general subjects also creates a positive precedent, proving its ease of adaptation. Furthermore, the facilitating conditions are highly supportive of technology adoption, with teachers having mastered various learning technologies and the available facilities being adequate. This collectively suggests that the levels of discomfort and insecurity towards AR technology at Chariyathamsuksa Foundation School tend to be minimal due to strong internal capacity and prior experience.

The TRI profile of the teaching staff can be considered the "invisible foundation" of the entire readiness structure. An unfavorable profile—for example, one dominated by high levels of Discomfort and Insecurity—can systematically undermine an entire technology initiative. The causal mechanism is clear: a teacher who is inherently uncomfortable and insecure with technology (a negative TRI profile) will naturally be biased in their perceptions. When faced with AR, this cognitive bias will make them more likely to focus on potential complexities and problems (increasing "Effort Expectancy" and decreasing "Performance Expectancy" in the UTAUT model), regardless of how sophisticated the provided devices are (ETRI) or how comprehensive the training is.

The implications are profound. It suggests that the most effective readiness strategies may not start with technology procurement (an ETRI intervention) or even with demonstrating benefits (a UTAUT intervention), but with human-focused interventions (TRI interventions). Long-term efforts may need to focus on cultural change and mindset development. This could include recruitment strategies that consider the technological disposition of prospective staff, or more importantly, designing professional development programs that go beyond skills training. Such programs should explicitly aim to build technological self-confidence, manage anxiety, and create "safe spaces" where teachers can experiment, make mistakes, and learn without fear of judgment. This marks a fundamental shift from mere "technology training" to holistic "technology mindset development."

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F. Synthesis and Comparative Readiness Profiles

This section integrates the analyses from all three layers—macro (ETRI), meso (UTAUT), and micro (TRI)—to construct a holistic and nuanced readiness profile for both MI Al Huda and Chariyathamsuksa. By comparing these two profiles directly, we can identify unique patterns, strengths, weaknesses, and specific strategic implications for each context.

The following table serves as an analytical summary of the report's findings, presenting a complex, multi-dimensional comparison in a concise format. It allows stakeholders to quickly identify critical areas and the most strategic points for intervention.

a. Summary of Layered Institutional Readiness Comparison

The following table serves as an analytical summary of the report's findings, presenting a complex, multi-dimensional comparison in a concise format. It allows stakeholders to quickly identify critical areas and the most strategic points for intervention.

Tabel 1. Summary of Layered Institutional Readiness Comparison

Framework	Component	MI Al Huda Readiness Profile (Indonesia)	Chariyathamsuksa Readiness Profile (Thailand)	Comparative Analysis & Strategic Implications
Macro Level (ETRI)	**School Management**	**Strong.** Driven by national policy (Kurikulum Merdeka) providing a mandate and autonomy for innovation. Technology vision tends to be integrated into school plans.	**Moderate.** Driven by partnership opportunities. Technology vision may be project-based and less systemically integrated into core institutional policy.	MI Al Huda has a stronger policy foundation for sustainability, while Chariyathamsuks a needs to focus on internalizing innovation to avoid dependency on external partners.
	Teachers	**Strong.** All teachers and staff actively participate in technology utilization training (e.g., Kahoot, Wordwall, AR Lab), showing high and equitable institutional commitment to digital capacity building.	**Strong.** Teacher capacity is driven by the school's role as a host for international academic events (e.g., IAF). This environment fosters a spirit of growth and exposure to global standards, complementing formal training through partnerships.	Both institutions require training that bridges technical skills with pedagogical integration relevant to the Islamic education curriculum.

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	Students	**Moderate.** Digital literacy varies; potential for a digital divide based on socio-economic background is a concern.	**Moderate.** Similar situation to MI Al Huda, with a potential gap in access to compatible devices.	Strategies for providing school devices or group-based learning are needed in both locations to ensure inclusivity.
	Devices & Connectivity	**Infrastructure Paradox.** Reliable connectivity (50 Mbps) and multimedia classrooms, but a very low device ratio (20 computers for 144 students) is a major barrier.	**Excellent.** Provides a tablet for every student (1:1 ratio), eliminating device access barriers and enabling more personal and flexible digital pedagogy.	The main gap is individual device access. MI Al Huda is hindered by a limited shared-resource model, while Chariyathamsuksa adopts a universal access model.
	Digital Resources	**Weak.** Dependent on free or open-source resources. Lack of culturally and curriculary relevant AR content, which was a key motivation for this research.	**Moderate to Strong.** Partnerships may provide access to premium content platforms or libraries.	The content gap is a shared problem. Chariyathamsuksa could potentially lead in content adaptation, while MI Al Huda could encourage inter-teacher collaboration.
Meso Level (UTAUT)	**Performance Expectancy**	**High (Aligned).** All stakeholders (teachers, leadership, students) see clear benefits from AR, from pedagogical solutions to strategic advantage and learning appeal.	**High (Inferred).** The school's strategic vision and international exposure suggest high expectations for technology as a tool for achieving excellence.	Demonstrating internal case studies showing tangible learning impacts is crucial in both institutions to turn skepticism into conviction.

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	Effort Expectancy	**Low (Divergent).** A large gap exists between students (find it very easy) and teachers (find it very complex), with leadership focused on systemic implementation difficulty.	**Moderate (Inferred).** The 1:1 device availability and prior experience likely reduce the perception of difficulty, but curriculum integration remains a challenge.	Simplifying workflows, providing templates, and offering just-in-time support are key to lowering effort perception in both schools.
	Social Influence	**Strong (Multi-scale).** Motivation comes from various directions: peers (students), leadership and colleagues (teachers), and external demands (leadership).	**Moderate to Strong.** Partnership projects and international reputation create social momentum, but it could fade after projects end.	Formalizing the role of "tech champions" and ensuring leadership actively models technology use will strengthen social norms in both institutions.
	Facilitating Conditions	**Low (Crucial).** Perception of support is very low for teachers and is an absolute prerequisite for adoption. Leadership also sees this as a major hurdle (budget, infrastructure).	**Strong (Inferred).** The 1:1 device availability and partnership support create very positive facilitating conditions.	Bridging this perception gap is a priority. Proactive communication about how to get support is a low-cost, high-impact intervention.
Micro Level (TRI)	**Drivers (Optimism, Innovativeness)**	Pockets of innovators exist, but the general profile tends to be moderate, with cautious optimism.	Likely slightly higher due to more frequent exposure to innovation through international projects.	Identifying and empowering these innovators as internal change agents is a vital strategy for both institutions.

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	Inhibitors (Discomfort, Insecurity)	**Fairly High.** Especially among senior teachers, there is a sense of being overwhelmed and skeptical about technology's reliability in a resource-limited environment.	**Moderate.** Although possibly more accustomed to technology, concerns about technical failures during teaching and data privacy persist.	Professional development must explicitly address these anxieties, creating a safe environment to experiment and learn from failure.

b. Analysis of MI Al Huda Kebonsari

MI Al Huda's readiness profile can be described as policy-driven. Its greatest strength lies at the macro level, particularly in the School Management pillar. The existence of the Kurikulum Merdeka provides a strong philosophical and policy foundation for leadership to drive innovation. This creates an environment where change is theoretically supported from the top.

However, this strength at the policy level does not automatically translate to the layers below. At the meso level, this policy push confronts the reality of stakeholder perceptions. Despite managerial support and high performance expectations from all parties, resource limitations (especially the low device ratio in the ETRI pillar) and a perceived lack of responsive technical support result in a low score for "Facilitating Conditions" (UTAUT). This, in turn, increases the "Effort Expectancy" for teachers, as they feel they must struggle alone if problems arise.

Furthermore, at the micro level, the staff's moderate TRI profile, with a fairly high level of "Discomfort" among some teachers, becomes the final inhibitor. A teacher who already feels anxious about technology (TRI) will see the lack of reliable support (UTAUT) as confirmation that trying new technology is too risky, regardless of what the school policy says (ETRI). This causal chain explains why technology initiatives at MI Al Huda might proceed slowly despite good intentions from management.

c. Analysis of Chariyathamsuksa Foundation School

Chariyathamsuksa's readiness profile is opportunity-driven. Its primary strength lies in its access to external resources through international partnerships. This provides a clear advantage in the material-based ETRI pillars, such as Devices (1:1 ratio), Connectivity, and Digital Resources. Exposure to international technologies and practices also has the potential to boost scores on the TRI driver dimensions (Optimism, Innovativeness) and UTAUT constructs (Performance Expectancy).

However, this model also has distinct vulnerabilities. Because innovation often arrives in the form of "projects," there is a risk that it does not become deeply embedded in the institutional culture and structure. Social Influence (UTAUT) may be high during a project but could decline afterward. More importantly, the School Management pillar (ETRI) may be less

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developed in terms of internal policies that ensure sustainability. If a partnership ends, does the school have a plan and the capacity to continue, maintain, and update its technology on its own? The challenge for Chariyathamsuksa is not acquiring technology, but institutionalizing it—transforming external opportunities into sustainable internal capacity. Without a deliberate internalization process, the school risks experiencing a cycle of "pilot projects" that never achieve full scale or long-term impact.

CONCLUSION

The comparative analysis between MI Al Huda and Chariyathamsuksa Foundation School demonstrates that there is no single approach to achieving technology readiness. MI Al Huda exhibits a policy-driven readiness, with a strong managerial vision but constrained by resources. Conversely, Chariyathamsuksa is opportunity-driven, rich in material resources thanks to external partnerships, but needs to institutionalize innovation for sustainability.

The key insight from this layered analysis is that true readiness is not merely a technical state but a complex socio-technical phenomenon. Investment in infrastructure must be balanced with efforts to shape positive perceptions and mindsets among staff. This means that an effective readiness strategy must focus on cultural change and mindset development, going beyond mere skills training. This report emphasizes that humans, with all their hopes and fears, are at the core of technological transformation, and balancing the adoption of cutting-edge technology with the preservation of the institutional mission is crucial for shaping a generation that is both digitally competent and of noble character.

Based on the findings of this comparative analysis, several strategic recommendations can be formulated for stakeholders to accelerate the effective adoption of immersive technology in Islamic education.

For institutions like MI Al Huda with a "policy-driven" readiness, the primary priority is to bridge the gap between a strong managerial vision and resource limitations. This can be achieved through strategic budget allocation to improve the student-device ratio , as well as establishing a responsive technical support system to reduce teachers' perceptions of "effort" and "discomfort".

For institutions such as Chariyathamsuksa that are "opportunity-driven," the challenge is to institutionalize innovation so that it is not solely dependent on projects or external partnerships. It is recommended to formulate internal technology policies focused on sustainability, as well as to develop internal capacity for adapting and creating relevant digital content.

For future researchers, this study could be expanded by using quantitative methods to measure readiness levels across a larger sample, or by conducting longitudinal studies to observe the long-term impacts of AR implementation on learning outcomes and student character within the context of Islamic education.

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