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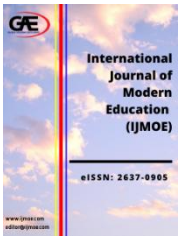

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TRANSFORMING HADITH STUDIES IN THE DIGITAL AGE: TOWARDS A NEW ASTRONOMOCAL HADITH PARADIGM

Mesbahul Hoque[1], Mohd Nor Adzhar Ibrahim[2]*, Mansir Abubakar[3], Mohd Zohdi Mohd Amin[4], Mohd. Sobri Ellias[5]

[1] Faculty of Quranic and Sunnah Studies, Universiti Sains Islam Malaysia
mesbahul@usim.edu.my https://orcid.org/0000-0001-5867-5914
[2] Faculty of Quranic and Sunnah Studies, Universiti Sains Islam Malaysia
mnor.adzhar@usim.edu.my https://orcid.org/0000-0001-6578-5126
[3] Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA, Shah Alam
mansir@uitm.edy.my https://orcid.org/0000-0001-9733-2906
[4] Faculty of Quranic and Sunnah Studies, Universiti Sains Islam Malaysia
zohdi@usim.edu.my https://orcid.org/0000-0002-5143-3426
[5] Faculty of Quranic and Sunnah Studies, Universiti Sains Islam Malaysia
sobri.ellias@usim.edu.my https://orcid.org/0009-0007-0642-9966
* Corresponding Author

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Abstract:

The rapid advancement of digital technology has significantly reshaped the landscape of Islamic scholarship, including the field of Hadith studies. In particular, traditions related to astronomical phenomena—such as prayer times, moon sighting, qiblah orientation, eclipses, and celestial signs—require renewed scholarly attention in light of contemporary scientific developments. This article examines how Hadith studies can be transformed in the digital age through the emergence of a new paradigm in Astronomical Hadith Studies. The study adopts a qualitative library research methodology by analysing classical Hadith sources, contemporary academic literature, and recent technological applications related to Islamic astronomy. It further explores the interaction between traditional textual scholarship and modern scientific tools such as astronomical calculations, satellite navigation systems, geospatial mapping, mobile applications, and artificial intelligence. The findings indicate that the classical approach to astronomical hadith interpretation, while foundational and authoritative, often relied on environmental observation methods suited to earlier historical contexts. In contrast, contemporary realities—such as urban obstruction, global mobility, polar regions, and digital

International Journal of Modern Education
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lifestyles—necessitate more adaptive and interdisciplinary approaches. The proposed paradigm integrates Hadith authentication, fiqh principles, astronomical data, and digital technologies to enhance accuracy, accessibility, and consistency in religious practice. It also highlights the importance of scholarly governance, app certification, and collaboration between hadith experts, astronomers, and software developers to prevent misinformation and methodological errors.

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Keyword:

Digitalization, Hadith Studies, Islamic astronomy, Technology

Introduction

Hadith studies have long occupied a central and authoritative position within the Islamic intellectual tradition (Hoque, Yusoff, Toure, & Mohamed, 2019). As one of the most rigorous disciplines in Islamic scholarship, it developed highly systematic methodologies to ensure the accurate preservation and transmission of the Prophet Muhammad's (PBUH)sayings, actions, and approvals. Classical scholars established advanced epistemological tools for authentication, particularly through the critical examination of chains of transmission (isnād) and textual content (matn). These methodologies enabled scholars to distinguish between ṣaḥīḥ (authentic), ḥasan (good), and ḍaʿīf (weak) narrations, forming a robust framework for safeguarding the Sunnah across generations (Azmi & Badia, 2012; Hoque, 2025).

The foundational contributions of eminent scholars such as Imām al-Bukhārī, Imām Muslim, and Ibn Ḥajar al-ʿAsqalānī further strengthened this discipline by refining classification systems, developing strict criteria for narrator reliability (ʿilm al-rijāl), and systematizing principles of textual criticism. Their intellectual legacy established Hadith sciences as a cornerstone of Islamic epistemology, ensuring that authenticity remained central to religious knowledge production (Ilahi et al., 2023; Supriyadi et al., 2020). Over centuries, these traditional methodologies have been preserved through manuscripts, scholarly transmission, and structured pedagogical systems within Islamic institutions.

In recent decades, however, the rapid expansion of digital technologies has significantly transformed the landscape of knowledge production, storage, and dissemination. The emergence of digital libraries, online Hadith databases, manuscript digitization projects, and artificial intelligence (AI)-driven analytical tools has introduced new dimensions to Islamic scholarship. These innovations have enhanced accessibility, enabling scholars and students worldwide to retrieve vast collections of Hadith literature instantly, while also facilitating comparative analysis across multiple sources (Salim & Aditya, 2025). At the same time, they

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume: 8 Issue: 30 (June 2026) PP. 437-453
have introduced new methodological and epistemological challenges, particularly concerning accuracy, verification, and scholarly authority in a digital environment.

This transformation raises critical scholarly questions: How can traditional Hadith methodologies adapt effectively to emerging digital tools without compromising authenticity standards? What are the epistemological implications of integrating automation and AI into processes traditionally governed by human expertise? And how can Islamic scholars preserve intellectual integrity and methodological rigor in an increasingly decentralized and algorithm-driven information ecosystem?

This article seeks to address these questions by critically examining the intersection of Hadith studies and digitalization. It argues that a new scholarly paradigm is essential —one that does not replace classical methodologies but rather reconfigures them through the strategic integration of modern technological capabilities. This paradigm calls for a balanced synthesis between traditional Islamic scholarship and digital innovation to ensure both authenticity and relevance in contemporary Hadith studies.

Historical Foundations of Hadith Studies

The historical foundations of Hadith studies represent one of the most sophisticated intellectual traditions in human history(Abdul-Rahman, 2024). From the earliest period of Islam, Muslims recognized the necessity of preserving the sayings, actions, and tacit approvals of the Prophet Muhammad (PBUH) as a primary source of guidance alongside the Qur'an(Tangngareng, 2017). This urgency led to the development of a highly structured and critical methodology that ensured both preservation and authenticity.

During the lifetime of the Prophet (PBUH), Hadith transmission was primarily oral(Elmaz, 2021). The Companions memorized his sayings and carefully observed his actions. Their strong reliance on memory was supported by the Arab culture of oral preservation, which was already highly advanced(Rasyid et al., 2021). At the same time, some Companions also recorded Hadith in written form, such as the well-known manuscript of ʿAbdullāh ibn ʿAmr ibn al-ʿĀṣ(Pervez, 2023). However, widespread documentation was initially limited to avoid confusion between the Qur'an and other texts.

After the passing of the Prophet (PBUH), the Companions took great care in transmitting Hadith(Rasyid et al., 2021). They exercised caution and restraint, often verifying reports before accepting them. Senior Companions such as Abū Bakr, ʿUmar ibn al-Khaṭṭāb, and ʿAlī ibn Abī Ṭālib emphasized careful verification and discouraged excessive narration without certainty(Bounama & Al-Halwani, 2025). This cautious approach laid the groundwork for the later formalization of Hadith sciences.

The generation of the Successors inherited this responsibility and expanded the transmission network as Islam spread geographically(Aljoumani & Reier, 2024). With the expansion of the Muslim world into regions such as Persia, Greater Syria, and North Africa, the need for systematic preservation became even more pressing. At this stage, scholars began traveling extensively in search of Hadith to collect narrations directly from reliable sources(Pervez, 2023). This culture of scholarly travel became a defining feature of Hadith studies and contributed significantly to the verification process. By the second century Hijri, the compilation of Hadith began to take a more organized form (Ibrahim et al., 2019). Early

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume: 8 Issue: 30 (June 2026) PP. 437-453
scholars such as Ibn Shihāb al-Zuhrī played a pivotal role in initiating official documentation under the patronage of the Umayyad Caliph ʿUmar ibn ʿAbd al-ʿAzīz(Fatmawati, 2023). This marked a turning point from primarily oral transmission to systematic written preservation. Collections during this period were often thematic or organized by legal topics, such as the *Muwaṭṭaʾ* of Imām Mālik(Rasyid et al., 2021).The third century Hijri is widely regarded as the golden age of Hadith compilation. During this period, scholars developed rigorous criteria for evaluating Hadith and produced the canonical collections known as the Six Major Books. Among the most prominent scholars were Imām al-Bukhārī and Imām Muslim, whose compilations are considered the most authentic after the Qur'an. Their works were distinguished by strict conditions for narrator reliability and continuity of the transmission chain. Central to Hadith methodology is the concept of the chain of transmission. This system is a unique feature of Islamic scholarship, whereby each Hadith is accompanied by a list of narrators linking it back to the Prophet (PBUH). Scholars meticulously examined each narrator in the chain, assessing their moral integrity and precision in transmission(Ilahi et al., 2023). This process gave rise to the discipline known as biographical evaluation, which documented the lives, reliability, and scholarly status of thousands of narrators.

In addition to chain analysis, scholars also developed criteria for evaluating the text of Hadith. Textual criticism involved examining the content for consistency with the Qur'an, established Sunnah, and sound reasoning(Ayub, 2018) . Reports that contradicted stronger evidence or contained irregularities were subject to rejection or reclassification. Based on these methodologies, Hadith were categorized into various classifications, including authentic, sound, and weak. This classification system provided a structured way to assess the reliability of narrations and remains a cornerstone of Hadith studies to this day.

Another important development was the emergence of specialized branches within Hadith studies, such as the study of hidden defects, rare expressions, and abrogation. These sub-disciplines reflect the depth and sophistication of the field, demonstrating that Hadith studies are not merely about transmission but also about critical analysis and interpretation.

The role of memorization continued to be central even after the proliferation of written texts. Many scholars were known to have memorized hundreds of thousands of Hadith along with their chains of transmission. This combination of oral and written preservation created a robust system that minimized errors and ensured continuity(Aljoumani & Reier, 2024). Furthermore, the scholarly ethos of Hadith studies emphasized integrity, humility, and accountability. Scholars often subjected their works to peer review by presenting them to other experts for validation(Sadeki, 2007). The concept of authorization also played a key role, whereby a student received permission from a teacher to transmit specific texts, ensuring a controlled and reliable transmission process.

With the advent of printing technology in later centuries, Hadith collections became more widely accessible. However, the foundational methodologies remained unchanged(Jaiyeoba & Osmani, 2024). The transition from manuscripts to printed books did not alter the fundamental principles of verification but rather facilitated broader dissemination.

In summary, the historical foundations of Hadith studies are characterized by a meticulous and multi-layered approach to preservation and authentication. From oral transmission and early documentation to the development of complex analytical sciences, the discipline reflects a unique synthesis of tradition, critical inquiry, and scholarly rigor. These foundations continue

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume: 8 Issue: 30 (June 2026) PP. 437-453
to serve as the benchmark against which modern developments, including digitalization, must be evaluated.

The Emergence of Digitalization in Islamic Studies

The emergence of digitalization in Islamic studies marks a significant transformation in the way knowledge is preserved, accessed, and disseminated(Zahraini et al., 2025). Traditionally, Islamic scholarship relied heavily on physical manuscripts, printed books, and face-to-face transmission of knowledge(Suaidi et al., 2025). While these methods ensured careful preservation and scholarly rigor, they were often limited by geographical boundaries, accessibility constraints, and time-intensive research processes. The integration of digital technologies has fundamentally reshaped this landscape, offered new opportunities while also introduced complex challenges(Anuradha, 2021).

Digitalization in Islamic studies began with the digitization of classical texts(Redkin & Bernikova, 2020). Libraries and research institutions undertook large-scale efforts to convert manuscripts and printed works into digital formats. These initiatives not only preserved fragile historical documents but also made them accessible to a global audience. Scholars who previously needed to travel to specific libraries or archives can now access rare manuscripts and primary sources online. This shift has significantly democratized access to Islamic knowledge, enabling students and researchers from diverse regions to engage with foundational texts.

One of the most important developments in this process has been the creation of searchable digital databases(Suwahyu, 2024). Unlike traditional printed texts, which require manual navigation, digital platforms allow users to search for specific words, phrases, or themes instantly. This has greatly enhanced research efficiency, particularly in fields such as Hadith studies, Quranic exegesis, and Islamic jurisprudence. Researchers can now compare multiple sources simultaneously, identify patterns, and conduct comprehensive analyses that would have taken months or even years using traditional methods. In addition to digitized texts, the rise of online academic platforms has played a crucial role in advancing Islamic studies. Educational institutions, research centers, and independent scholars have developed websites and portals that host lectures, articles, and course materials. Massive Open Online Courses (MOOCs) and virtual classrooms have further expanded access to Islamic education. Students are no longer restricted to local institutions; they can now learn from scholars across the world, participate in online discussions, and access a wide range of academic resources.

The integration of multimedia technologies has also enhanced the learning experience. Audio recordings, video lectures, and interactive tools provide alternative ways of engaging with Islamic knowledge(Sholeh, 2023). For example, students studying prophetic traditions can listen to recitations, watch explanatory lectures, and interact with digital tools that illustrate complex concepts. This multimodal approach caters to different learning styles and makes Islamic studies more accessible to a broader audience. Another significant aspect of digitalization is the role of data analytics and computational tools(Sholeh, 2023). Researchers are increasingly using digital methods to analyze large datasets of texts. Text mining, data visualization, and computational analysis enable scholars to identify trends, patterns, and relationships within vast bodies of literature. These tools have opened new avenues for interdisciplinary research, allowing Islamic studies to intersect with fields such as computer science, linguistics, and digital humanities.

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume: 8 Issue: 30 (June 2026) PP. 437-453

The Emergence of Digitalization in Hadith Studies

The emergence of digitalization in Hadith studies represents a transformative shift in the methods through which prophetic traditions are accessed, analyzed, and disseminated(Salman, 2024). Traditionally, Hadith scholarship relied on oral transmission, handwritten manuscripts, and later printed compilations. These methods, while highly rigorous and reliable, required significant time, effort, and physical access to specialized libraries and scholarly networks. The integration of digital technologies has redefined these processes, enabling greater accessibility, efficiency, and innovation in the study of Hadith.

One of the earliest stages of digitalization in Hadith studies involved the digitization of classical Hadith collections. Canonical works, such as the major compilations of prophetic traditions, have been converted into digital formats and made available through online platforms and software applications (Supriyadi et al., 2020). This development has significantly reduced the barriers to accessing primary sources. Researchers and students can now consult multiple Hadith collections simultaneously without the need for physical copies, thereby facilitating comparative analysis and cross-referencing.

A major advancement brought by digitalization is the development of searchable databases. These databases allow users to locate specific Hadith texts instantly using keywords, narrator names, or thematic categories(Darmalaksana, 2021). In traditional research settings, identifying a single narration across multiple volumes could require hours or even days of manual effort. Digital tools have drastically shortened this process, enabling scholars to conduct more comprehensive and systematic analyses. This efficiency has proven particularly valuable in fields such as jurisprudence, theology, and historical studies, where precise referencing of Hadith is essential.

Digitalization has also enhanced the study of chains of transmission. By organizing narrators and their relationships into structured datasets, digital tools enable scholars to examine transmission networks in new ways(Muhlis & Hajar, 2023). Visualization software can map connections between narrators, revealing patterns of transmission across regions and generations. Such tools provide insights into the spread of Hadith and the interactions between scholars, offering a broader perspective that complements traditional analytical methods.

In addition to database development, the integration of computational techniques has opened new avenues for textual analysis. Natural language processing and text mining technologies allow researchers to examine large corpora of Hadith texts, identifying recurring themes, linguistic patterns, and variations in wording(Abdelkader et al., 2019). These methods support a more systematic approach to textual criticism and can assist in detecting inconsistencies or anomalies within narrations. While such tools cannot replace the expertise of trained scholars, they serve as valuable aids in managing and interpreting vast amounts of data. Another significant aspect of digitalization is the rise of mobile applications and online learning platforms dedicated to Hadith studies(Zulkipli et al., 2017). These platforms provide users with easy access to collections, commentaries, and educational resources. Features such as translation, annotation, and audio explanations enhance the learning experience and make Hadith studies more accessible to a global audience. Students at various levels can benefit from these tools, whether they are beginners seeking introductory knowledge or advanced researchers conducting specialized studies.

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume: 8 Issue: 30 (June 2026) PP. 437-453

The role of social media and digital communication platforms has also influenced the dissemination of Hadith (Sule, 2020). Prophetic traditions are frequently shared through messaging applications, websites, and social networks, reaching audiences far beyond traditional academic circles. This widespread dissemination has increased public engagement with Hadith literature and contributed to greater awareness of the Prophet's teachings. However, it has also introduced challenges related to the verification and authenticity of shared content.

Artificial intelligence is emerging as a powerful tool in the digitalization of Hadith studies(Salim & Aditya, 2025). Machine learning algorithms can assist in organizing large datasets, classifying narrations, and identifying similarities between texts. These technologies have the potential to support preliminary analysis, particularly in areas such as narrator evaluation and textual comparison. For example, algorithms can be trained to detect patterns in transmission chains or highlight discrepancies between different versions of a narration. Despite these capabilities, the interpretive and evaluative aspects of Hadith scholarship remain dependent on human expertise, as they require contextual understanding and nuanced judgment. The opportunities created by digitalization are substantial. Accessibility has been significantly enhanced, allowing scholars and students from diverse geographical backgrounds to engage with Hadith sources(Hemmet, 2023). Research efficiency has improved through advanced search and analytical tools, enabling more comprehensive and timely studies. Furthermore, digital platforms facilitate collaboration among scholars, encouraging the exchange of ideas and the development of interdisciplinary approaches.

Technological Tools in Hadith Studies

The integration of technological tools into Hadith studies represents a significant development in the evolution of Islamic scholarship. While the traditional methodologies of Hadith sciences remain foundational, modern technologies have introduced new methods that enhance research, analysis, teaching, and dissemination(Darmalaksana, 2021). These tools do not replace classical scholarship but rather complement it by increasing efficiency, accessibility, and analytical capacity. As the volume of digitized Hadith literature continues to grow, technological tools have become essential for managing and engaging with vast collections of data. One of the most prominent technological advancements in Hadith studies is the development of digital databases(Abdul-Rahman, 2024). These databases compile extensive collections of Hadith texts from classical sources and organize them in searchable formats. Users can retrieve narrations using keywords, narrator names, or thematic categories. This capability significantly reduces the time required for research. Instead of manually searching through multiple volumes, scholars can quickly identify relevant narrations and compare different versions of the same report. Digital databases also facilitate cross-referencing, allowing researchers to trace a Hadith across various collections and examine its variations.

In addition to databases, specialized software applications have been developed to support Hadith research. These programs often include advanced search functions, indexing systems, and tools for organizing references. Some applications provide integrated access to commentaries, biographical works, and legal discussions, enabling a more comprehensive understanding of each narration(Kabir et al., 2018). Such tools are particularly useful for students and early-career researchers, as they simplify complex research processes and provide structured access to authoritative sources. Another important technological tool is data visualization. Visualization software allows scholars to represent complex information in

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume: 8 Issue: 30 (June 2026) PP. 437-453

graphical formats, such as charts, maps, and network diagrams. In Hadith studies, this is especially valuable for analyzing chains of transmission(Muhlis & Hajar, 2023). By mapping the relationships between narrators, researchers can identify patterns, clusters, and connections that may not be immediately apparent through textual analysis alone. Visualization tools can reveal how narrations spread across regions and generations, providing new insights into the historical development of Hadith literature.

Artificial intelligence has further expanded the possibilities of technological integration in Hadith studies. Machine learning algorithms can process large datasets and identify patterns that would be difficult to detect manually(Zadeh, 2023). For example, these algorithms can be used to classify narrations based on their content, detect similarities between texts, or identify potential inconsistencies. Artificial intelligence can also assist in organizing and categorizing large collections of Hadith, making them more accessible for research and study(Çakır, 2023). However, it is important to emphasize that such tools are supportive rather than definitive, as they lack the contextual understanding and critical judgment of human scholars.

Natural language processing is another key technological development. This field focuses on enabling computers to understand and analyze human language. In the context of Hadith studies, natural language processing can be used to examine linguistic patterns, identify key themes, and analyze variations in wording across different narrations.(Moath et al., 2014) These techniques can support textual criticism by highlighting differences between versions of a Hadith and suggesting areas for further investigation. Additionally, natural language processing can assist in translation and annotation, making Hadith texts more accessible to non-specialist audiences.

Mobile applications have also played a significant role in the dissemination of Hadith knowledge. These applications provide users with easy access to collections, explanations, and educational resources. Features such as daily Hadith notifications, thematic categorization, and audio explanations make learning more interactive and engaging(Hadi, 2020). Mobile platforms have expanded the reach of Hadith studies beyond academic institutions, allowing individuals from diverse backgrounds to engage with prophetic teachings in their daily lives.
Online learning platforms represent another important technological tool. Virtual classrooms, recorded lectures, and interactive courses enable students to study Hadith regardless of their geographical location. These platforms often include discussion forums, assessments, and collaborative activities that enhance the learning experience (Hoque et al., 2019). The flexibility of online education has made it possible for a wider audience to access specialized knowledge and engage with qualified scholars.

Cloud computing has also contributed to the advancement of Hadith studies. By storing data on remote servers, cloud technology allows users to access resources from any location with an internet connection(Usman et al., 2014). This facilitates collaboration among researchers, as they can share data, annotations, and findings in real time. Cloud-based platforms also support the preservation of digital texts, reducing the risk of data loss and ensuring long-term accessibility.

Another emerging tool is the use of digital annotation systems. These systems allow scholars to add notes, comments, and references directly to digital texts. Annotations can be shared with other users, creating a collaborative environment for scholarly discussion(Nantke &

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume: 8 Issue: 30 (June 2026) PP. 437-453

Schlupkothen, 2020). This feature is particularly valuable for academic research, as it enables scholars to engage with texts in a dynamic and interactive manner.

Opportunities and Challenges Presented by Digitalization

The digitalization of Hadith studies has introduced a transformative shift in the way prophetic traditions are accessed, analyzed, and disseminated. While traditional methodologies remain central to Islamic scholarship, digital technologies have created new possibilities that enhance research efficiency, expand accessibility, and support innovative analytical approaches. At the same time, this transformation brings a set of challenges that require careful consideration to ensure that the integrity and authenticity of Hadith scholarship are preserved(Salman, 2024). Understanding both the opportunities and challenges is essential for developing a balanced and sustainable approach to digital Hadith studies.

One of the most significant opportunities presented by digitalization is the unprecedented accessibility of Hadith literature. Previously, access to major Hadith collections required physical presence in specialized libraries or institutions. Today, digitized versions of classical works are available online, allowing students and researchers from around the world to engage with primary sources instantly(Supriyadi et al., 2020). This democratization of knowledge has significantly expanded the reach of Hadith studies, enabling individuals from diverse academic and geographical backgrounds to participate in scholarly discourse.

Another important opportunity lies in research efficiency. Digital search engines and databases allow users to locate specific narrations within seconds by using keywords, themes, or narrator names. This has greatly reduced the time required for literature review and comparative analysis. Researchers can now examine multiple Hadith collections simultaneously, cross-reference narrations, and identify variations with ease(Darmalaksana, 2021). Such efficiency not only accelerates academic work but also allows scholars to focus more on interpretation and critical analysis rather than manual searching.

Digitalization also supports advanced analytical methods. Computational tools enable the processing of large datasets of Hadith texts, making it possible to identify patterns, trends, and relationships that would be difficult to detect manually (Abdul-Rahman, 2024). For example, network analysis can be used to study the relationships between narrators, revealing how transmission chains evolved across time and regions. Similarly, linguistic analysis tools can examine differences in wording across narrations, contributing to deeper textual understanding. These methods open new interdisciplinary pathways between Hadith studies and fields such as data science, linguistics, and digital humanities. In addition, digital platforms have enhanced educational opportunities. Online learning systems, mobile applications, and multimedia resources have made Hadith education more interactive and engaging. Students can access lectures, explanations, and annotations in various formats, including audio and video(Restalia & Khasanah, 2025). This flexibility supports different learning styles and allows learners to study at their own pace, thereby making a learning process more personalized today. Furthermore, virtual classrooms and online forums enable communication between students and scholars across the globe, fostering a more connected academic community.

Despite these advantages, digitalization also presents several challenges. One of the most pressing issues is the reliability and authenticity of online content. The ease of publishing information on digital platforms has led to the circulation of unverified or inaccurate

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume: 8 Issue: 30 (June 2026) PP. 437-453

narrations(Adiyono et al., 2024). Unlike traditional scholarly environments, where texts undergo rigorous verification, digital spaces often lack standardized quality control. This increases the risk of misinformation, which can lead to misunderstanding of prophetic teachings.

Another challenge is the potential overreliance on technology. While digital tools offer convenience and speed, they may encourage superficial engagement with Hadith texts. The traditional study of Hadith emphasizes deep reading, memorization, and critical reflection. If researchers rely too heavily on automated search functions and summaries, there is a risk of losing the depth and rigor that characterize classical scholarship(Mufid, 2024). Maintaining a balance between technological efficiency and scholarly depth is therefore essential.

A further concern is the limitation of technological interpretation. Although artificial intelligence and computational tools can process large amounts of data, they cannot fully capture the contextual and interpretive dimensions of Hadith scholarship. The evaluation of narrations requires expertise in historical context, linguistic nuance, and methodological principles(Wasman et al., 2023). These aspects depend on human judgment, which cannot be replaced by algorithms. Therefore, digital tools must be viewed as supportive instruments rather than independent authorities.

Ethical issues also arise in the digital environment. The widespread sharing of Hadith on social media and messaging platforms increases the risk of misattribution and misuse. Without proper verification, narrations may be circulated without context or accuracy, leading to distortion of meaning.(Hakak et al., 2020) Additionally, concerns related to intellectual property and proper citation must be addressed to ensure academic integrity in digital scholarship.

The digital divide presents another significant challenge. While digital tools are widely available in many parts of the world, access to reliable internet and advanced technologies remains uneven. This creates disparities in educational and research opportunities, potentially limiting participation from under-resourced communities.(Ranbir, 2024) Addressing this gap is essential to ensure that the benefits of digitalization are equitably distributed.

Towards a New Paradigm in Astronomical Hadith Studies

Astronomical Hadith Studies refers to the interdisciplinary examination of Prophetic traditions related to celestial phenomena, including prayer times, moon sighting, fasting schedules, qiblah orientation, eclipses, seasonal changes, and cosmic signs (Bahri & Hasibuan, 2024; Riza et al., 2025). Traditionally, these hadiths were interpreted through classical jurisprudence, linguistic analysis, and direct observation of nature (Ilyas, 1997). However, the rapid expansion of digital technologies, satellite systems, astronomical software, and data analytics has created the need for a new paradigm that integrates traditional Islamic scholarship with modern scientific tools (Al Ayyubi et al., 2025). This emerging framework seeks not to replace classical scholarship, but to enhance it through methodological precision, wider accessibility, and contemporary relevance (Nurkhanif et al., 2024).

Historically, many hadiths concerning acts of worship were directly connected to observable astronomical events. The Prophet Muhammad (peace be upon him) explained prayer times according to the movement of the sun, such as the length of shadows for ʿAsr, sunset for Maghrib, and dawn light for Fajr. Likewise, the beginning and end of Ramadan were linked to

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume: 8 Issue: 30 (June 2026) PP. 437-453

the sighting of the crescent moon. These traditions reflected the environmental realities of seventh-century Arabia, where religious practice depended upon direct visual observation and communal testimony (Ilyas, 1997). Contemporary studies affirm that Qur'anic and Prophetic guidance on prayer times remains rooted in natural astronomical markers, even when modern calculations are used for precision (Avissa et al., 2024).

The first component of the new paradigm is the harmonization of textual interpretation and empirical astronomy. Rather than treating hadith and science as separate domains, scholars increasingly recognize their complementary roles. Hadith provides normative guidance, while astronomy offers technical means of measurement. For example, determining fajr today involves calculating the solar depression angle below the horizon, while remaining faithful to the Prophetic description of true dawn. Similarly, sunset and twilight calculations help define Maghrib and ʿIshaʾ more accurately in complex urban or high-latitude settings (Riza et al., 2025). Recent scholarship notes that mathematical technology has transformed prayer-time determination while simultaneously challenging traditional authority structures, requiring renewed scholarly engagement (Al Ayyubi et al., 2025).

The second component is digital verification of qiblah orientation. Earlier Muslim communities used stars, wind directions, and geographical reasoning to face the Kaʿbah. Today, GPS systems, spherical trigonometry, and mobile applications can calculate qiblah azimuth instantly from nearly any location. While these tools provide convenience, they also raise concerns about calibration errors, magnetic interference, and overdependence on unverified apps. Research has shown that even slight directional deviations may produce significant geographical displacement over long distances, highlighting the need for accuracy and scholarly oversight (Faid et al., 2022). Thus, the new paradigm combines technological efficiency with juristic supervision.

A third component involves the reinterpretation of moon-sighting traditions through astronomical modeling. Classical jurists debated whether the beginning of lunar months depends solely on naked-eye sighting or whether calculations may assist the process. Modern astronomy can now predict conjunction, moon altitude, elongation, and visibility probability with great precision. Planetarium simulations have even been used to reconstruct lunar visibility during the Prophet's era, offering fresh insight into historical reports and lunar calendar practices (Nurkhanif et al., 2024). This does not necessarily eliminate traditional sighting practices, but it enables more informed and unified decision-making among Muslim communities.

The fourth dimension of the new paradigm is the expansion of research methodology. Traditional hadith studies emphasized isnād criticism, narrator reliability, and textual authenticity. While these remain indispensable, astronomical hadith studies now require additional competencies: data interpretation, geospatial mapping, historical chronology, software literacy, and interdisciplinary collaboration. A scholar analyzing reports on eclipses, for example, may compare hadith narrations with historical eclipse databases to assess chronology. Likewise, reports on seasonal fasting durations or sunrise times can be evaluated against geographical realities (King, 2005). Such methods deepen rather than weaken classical hadith scholarship.

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume: 8 Issue: 30 (June 2026) PP. 437-453

Another major feature of this paradigm is addressing new contexts unknown to earlier scholars. Muslims now live in polar regions where daylight patterns are extreme, in global cities affected by pollution and skyline obstruction, and even in contexts involving air travel or space exploration. Contemporary studies have discussed how prayer times and qiblah may be determined in near-Earth space, showing that modern realities demand renewed *ijtihād* grounded in both revelation and science (Sulthani, 2023). Therefore, astronomical hadith studies must evolve to respond to unprecedented circumstances while preserving the objectives of worship.

Institutionally, the new paradigm calls for collaboration between hadith scholars, astronomers, software engineers, and fatwa councils. Universities should establish centers for Islamic astronomy and Sunnah studies where students receive dual training in religious sciences and observational methods. Certification systems for Islamic apps, prayer-time software, and qiblah tools would also help protect public trust (Al Ayyubi et al., 2025). Without scholarly governance, digital misinformation can spread quickly, leading to confusion in worship practices.

Nevertheless, caution is necessary. The embrace of technology should not lead to scientism, where numerical data is treated as superior to revelation, nor should it dismiss the wisdom embedded in Prophetic simplicity. The purpose of astronomy in Islam is ultimately devotional rather than merely technical. Celestial calculations are tools that facilitate obedience, unity, and certainty in worship (Ilyas, 1997). Hence, the new paradigm must remain ethically grounded and spiritually conscious.

Conclusion and Recommendations

The transformation of Hadith studies in the digital age demonstrates the continuing relevance and adaptability of the Prophetic tradition in responding to contemporary challenges. In the field of Astronomical Hadith Studies, classical narrations concerning prayer times, moon sighting, qiblah orientation, eclipses, and celestial phenomena remain foundational sources for Muslim worship and legal practice. However, modern realities such as urbanisation, global mobility, technological dependence, high-latitude environments, and the increasing use of digital applications require new methods of engagement. This study has shown that a new paradigm is necessary—one that integrates traditional hadith scholarship with contemporary astronomy, geospatial sciences, and digital technologies. Such an approach does not replace the authority of revelation, but rather enhances its practical application through precision, accessibility, and contextual relevance.

The findings indicate that classical methodologies such as isnād criticism, matn analysis, and juristic interpretation continue to be indispensable. Nevertheless, these methods can be strengthened through interdisciplinary tools including astronomical calculations, satellite navigation systems, crescent visibility models, historical databases, and artificial intelligence. By harmonising textual evidence with empirical observation, scholars are better equipped to address current issues such as conflicting moon-sighting announcements, inaccurate prayer-time applications, qiblah misalignment, and emerging questions related to aviation or space travel. Therefore, the proposed paradigm presents Hadith studies not as a static discipline, but as a dynamic field capable of guiding modern civilisation while preserving its spiritual and ethical foundations.

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume: 8 Issue: 30 (June 2026) PP. 437-453

Several recommendations may be advanced. First, universities and Islamic research institutions should establish specialised centres for Astronomical Hadith Studies that combine expertise in hadith, fiqh, astronomy, and digital sciences. Second, curricula in Islamic studies should include basic training in astronomy, data literacy, and technological applications to prepare future scholars for interdisciplinary engagement. Third, national fatwa bodies and religious authorities should collaborate with scientists and software developers to certify prayer-time apps, qiblah tools, and moon-sighting platforms in order to ensure public trust and methodological accuracy. Fourth, further research should explore the potential of artificial intelligence in hadith classification, predictive astronomical modeling, and multilingual dissemination of scholarly rulings. Fifth, greater international cooperation is needed among Muslim countries to reduce inconsistencies in lunar calendar decisions and prayer-time standards. Finaly, the future of Astronomical Hadith Studies lies in constructive collaboration between revelation and reason, tradition and technology, faith and scientific advancement.

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IJMOE
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