GLOBALIZATION OF ISLAMIC ASTRONOMICAL INFORMATION: ITS IMPACT ON THE METHOD OF DETERMINING THE THE BEGINNING OF THE HIJRI MONTH

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Abstract

The globalization of information has brought significant changes in the dissemination and exchange of Islamic astronomical data, particularly in relation to determining the start of the Hijri month. This study aims to examine the impact of global connectivity through information technology on the dynamics of differences and efforts to unify the criteria for hisab and rukyat in various countries. The research method used is a qualitative study with a cross-country case study approach, involving literature analysis and data retrieval from international astronomical information platforms. The results show that information globalization accelerates public and authority access to real-time astronomical data, but also reinforces methodological differences based on sectarian, political, and cultural factors. On the one hand, technology strengthens international coordination through global forums such as the International Crescent Observation Project (ICOP) and the Organisation of Islamic Cooperation (OIC); on the other hand, information openness triggers public debate that can widen the gap in agreement. This study recommends strengthening astronomical diplomacy and developing cross-border collaborative platforms to support the harmonisation of the global Hijri calendar without neglecting the diversity of each country's astronomical traditions.

Keywords: Astronomy, Information Globalization, Hisab rukyat, Hijri Calendar

INTRODUCTION

Starting from the increasingly connected world through the internet and digital platforms, Islamic astronomical information especially related to hisab and rukyat has experienced an unprecedented acceleration in cross-border circulation. Technical discussions on crescent visibility criteria, astronomical modeling, as well as fatwas and decisions by religious authorities now move within minutes among communities of astronomical experts, official institutions, mass organizations, and the general public. This phenomenon opens up opportunities for methodological harmonization, increased astronomical literacy, and transparency in the process of determining the beginning of the Hijri month. However, at the same time, the rapid flow of information also poses new challenges: the acceleration of opinions before verification, polarization of methods, and

"competition for authority" between scientific sources, state institutions, and religious authorities across countries.

The problem becomes even more apparent when viewed from the perspective of the reach and speed of data dissemination. Globally, internet users have exceeded 5 billion people (60–65% of the world's population), with more than 4.5 billion active social media accounts (Rahmatullah, 2021); in Muslim-majority regions (South-Southeast Asia, the Middle East, North Africa), the growth of connectivity and online astronomy groups and communities has increased significantly. During crucial moments such as the determination of the start of Ramadan and Shawwal, posts of crescent visibility maps, field observation results, and CCD/DSLR images are widely circulated—often before adequate methodological confirmation is available. As a result, in recent years the public has often encountered differences in the start of the month between countries—and even between regions within a single country which are perceived as "contradictions" amid the abundance of data. Field data from the rukyat community shows hundreds of observation reports every strategic Hijri month, but the lack of synchronization between criteria, verification authorities, and the timing of decision releases often triggers confusion and debate in the digital space. This indicates the need for a systematic study of how the globalization of Islamic astronomical information affects the choice of methods and results of determinations in various countries.

The globalization of Islamic astronomical information is operationalized as the intensity, speed, and scope of the circulation of astronomical knowledge (theories, observational data, software, institutional bulletins, and authority decisions) through cross-border digital media. The indicators include: (1) the availability and public access to crescent visibility data (maps, curves, observation reports), (2) the involvement of communities/authorities in online channels (institutional websites, social media, e-mail lists, hisab software repositories), (3) standards for information curation and verification (rukyat documentation procedures, instrument metadata, timestamps, geographic positions), and (4) cross-jurisdictional interactions (quotes, adoption, or criticism of policies between countries). With this framework, globalization is not merely about the "number of uploads," but rather the quality of the information ecosystem that encourages or hinders scientific and fiqh consensus (Azizah, 2025) .

The global flow of information also influences the criteria for determining the start of the Hijri month, whether through the practice of hisab methods (based on visibility criteria such as Yallop/Odeh, elongation parameters, moon height, moon age, and illumination), rukyat (direct observation with instrument verification), as well as hybrid approaches and administrative policies (e.g., the deadline for ijtima' before sunset, or the adoption of a pre-calculated calendar). The observed impacts include: (a) changes in preference for criteria (e.g., adjustments to MABIMS parameters or the adoption of new criteria), (b) accelerated decision-making due to the availability of real-time global simulations and predictions, (c) improved quality of rukyat documentation (photos, videos, astrometric data), and (d) the emergence of tensions when global data conflicts with local testimony requirements or differing standards of proof.

The determination of the beginning of the Hijri month in various countries varies depending on specific policies and practices. MABIMS countries (Indonesia, Malaysia, Brunei Darussalam, Singapore) use regional visibility criteria; Saudi Arabia uses the Umm al-Qura calendar and verification by authorities; Turkey emphasizes consistency in calculations (via Diyanet) with specific astronomical criteria; Morocco uses a strict local rukyat system and a network of official observers; Pakistan with its Ruet-e-Hilal committee; African regions (e.g., Nigeria) that combine federal and state religious authorities; and Muslim minority communities in Europe and North America (e.g., *the Fiqh Council of North America)* that often refer to astronomical calculations for unification. This cross-country comparison is important for understanding how global information flows negotiate with legal-religious regimes, observation infrastructure, geography, and institutional capacity—as well as when globalization facilitates convergence and when it actually reinforces divergence (Faizi, 2025).

Based on this background, the objectives of this study are to describe and analyze the patterns of globalization of Islamic astronomical information, identify and evaluate its impact on methods of determining the beginning of the Hijri month, and conduct a cross-country comparison of practices for determining the beginning of the Hijri month to find patterns of divergence and convergence. With these objectives, this study is expected to contribute theoretically, methodologically, and practically to the development

of astronomy and strengthen the role of Muslims in responding to differences in a more wise and solution-oriented manner.

LITERATURE REVIEW

Previous studies on determining the beginning of the Hijri month conducted by Hartono and Yunus, entitled "Analysis of Determining the Beginning of the Hijri Month Using the Hisab and Rukyat Approaches," found similarities and differences (Hartono & Yunus, 2025) . The similarities lie in highlighting the dialectic between religious tradition and modern scientific developments in determining the Hijri calendar. The difference is that the study emphasizes hisab and rukyat, reviewing more methodological aspects, epistemological aspects, and the underlying fiqh legal legitimacy, while this study highlights how global information flows, digital technology, and interactions between religious authorities across countries accelerate harmonization while widening differences in determining the beginning of the month. Thus, the two complement each other: the former explains the methodological roots of the differences, while the latter shows the contemporary dynamics shaping the new landscape of Islamic calendar authority.

The next study is the work of Herman et al. on the controversy between hisab and rukyat in determining the Islamic calendar in the Modern Era: A Contemporary Fiqh Approach(Herman et al., 2024). This research emphasizes the advantages, disadvantages, and efforts to find common ground between the two methods. Hisab is considered accurate because it is not influenced by weather, while rukyat is maintained as a practice in accordance with sharia guidance through the observation of the crescent moon. This focus is similar to studies on the globalization of Islamic astronomical information, which also examine the dynamic tension between religious tradition and modern science. The similarity lies in the attention to epistemological validity and the legitimacy of the authority that determines the beginning of the Hijri month, while the difference lies in the context. The former research highlights methodological aspects and contemporary fiqh in Indonesia, while this research highlights how cross-border information flows, digital technology, and global communication accelerate harmonization but at the same time

widen fragmentation among Muslims. Thus, the two complement each other in the landscape of determining the beginning of the month.

In other studies, such as Juwartin's research, the focus tends to be on developing criteria for crescent visibility based on telescopic data and probabilistic models, for example, the work of Ilyas (Juwartin, 2011), while Odeh's research emphasizes the refinement of astronomical parameters (Amin, 2018). Then there are studies on domestic policy regarding the determination of the beginning of the month in Thomas Djamaluddin's research, such as a study of the practice of hisab-rukyat in Indonesia (Alwi, 2020). Another study on the normative analysis of fiqh regarding the standards of testimony and the authority of determination (Hidayat, 2012). This research uses "information globalization" as the main lens to explain the real impact on the choice of methods and results of determination in various jurisdictions comparatively. Thus, its contribution lies in the globalization of astronomical information, mapping the causal relationship between information flows and changes in methods/decisions, and cross-country comparisons that link astronomical, institutional, and sociological dimensions within a single analytical framework.

RESEARCH METHOD

This study uses a qualitative approach with a descriptive-comparative method. This approach was chosen to enable an in-depth exploration of the phenomenon of Islamic astronomical information globalization and how it influences the methods of determining the beginning of the Hijri month in various countries. The descriptive-comparative method facilitates researchers in describing the actual reality in detail while comparing practices, policies, and dynamics that are developing in various world astronomical authorities, thereby producing a more comprehensive understanding of the issue of hisab rukyat in a global context.

Data collection techniques were carried out through a literature review of astronomy books, reputable journal articles, official documents from international Islamic astronomy institutions, and rukyat observation reports published online. In addition, the researcher also searched for digital data from the official websites of fatwa institutions, ministries of religion, and world astronomy centers, as well as searching the social media

of modern astronomy institutions that actively disseminate rukyat results and hisab data in real-time. This combination of textual, digital, and empirical report sources provides a strong, up-to-date, and relevant information base for in-depth analysis.

The collected data was analyzed using content analysis techniques to identify themes, trends, and knowledge constructions related to the globalization of Islamic astronomical information. Furthermore, cross-country comparative analysis was used to compare patterns of determining the beginning of the month in various astronomical authorities, whether based on calculations, sightings, or integrative models. Through a combination of these two techniques, the study was able to map the differences, similarities, and implications of information globalization on the development of calculation-sighting methods, resulting in a holistic, systematic, and in-depth picture.

RESULTS AND DISCUSSION

Globalization of Islamic Astronomical Information: Forms of Globalization of Astronomical Information

The development of information technology has fundamentally changed the way Muslims access, study, and distribute information related to astronomy. The internet allows the public to obtain astronomical data quickly and extensively, ranging from calculation schedules, crescent visibility maps, to field observation results published in real-time. Official websites of national and international astronomy institutions, such as NASA, IMCCE, and regional Islamic institutions, provide open databases that anyone can access. This means that astronomy is no longer exclusive to a limited group of people, but is open to the wider community, thereby increasing religious literacy and expanding public participation in the discourse on determining the beginning of the Hijri month (Jaelani, 2021).

In addition, social media plays a significant role in accelerating the globalization of astronomical information. Platforms such as Facebook, Twitter (X), YouTube, and Telegram have become the main spaces for the Islamic astronomy community to share data, observation results, and methodological studies (Fikri & Indriana, 2024). This dissemination of information is further strengthened by the availability of smartphone-based astronomy applications, such as *Stellarium, SkySafari,* or local hisab-rukyat

applications that enable Muslims to independently simulate the positions of the moon and sun. The presence of social media and astronomy applications not only increases public engagement but also creates new challenges in the form of a flood of information that may not be verified, thus requiring critical literacy in sorting out the validity of data. Thus, the globalization of astronomical information through digital technology has a dual impact: it expands access while demanding an increase in the verification capacity of the community and institutions.

Public access to calculation data and crescent visibility maps is now more open with the development of digital technology. Whereas in the past, calculation information was only available to a limited circle of astronomers, academics, or official religious institutions, this data can now be easily obtained through the websites of astronomical institutions, scientific journals, and online applications. Crescent visibility maps, for example, which previously required special software and technical skills, can now be accessed instantly through international astronomy institution websites or mobile applications. This enables Muslims in various countries to follow astronomical developments more directly, even before the official authorities announce the results of the determination of the beginning of the Hijri month.

In addition to calculation data, rukyat reports, which were once local in nature, have also undergone a significant transformation through online publication. Rukyat communities and government agencies often share their observations in the form of photos, videos, or descriptions on social media, community forums, and official websites. The public can quickly compare various reports from different locations, both within a country and across countries, creating a dynamic global information ecosystem. However, this openness also raises problems: not all reports are accompanied by adequate scientific verification, which has the potential to cause debate in the public sphere. Therefore, although public access to calculation data, crescent visibility maps, and online sighting reports increases literacy and participation among the community, a credible validation system and authoritative decision-making body is still needed to ensure that this information is truly useful and does not cause confusion.

The shift in communication patterns in the field of astronomy is evident from what was previously limited to the scope of official authorities to what has now developed into

a very open global public space. In the past, information related to determining the beginning of the Hijri month was usually only announced through official government channels or certain religious institutions, and the public simply accepted these decisions without much access to the process behind them. However, the digital era has changed this pattern: the public can now directly follow discussions among astronomy experts, access raw astronomical data, and listen to scientific arguments that previously only circulated in academic forums or religious meetings. This marks the birth of more active public participation in the discourse on determining the Hijri calendar.

This openness in communication has given rise to two contrasting sides. On the one hand, the public has the opportunity to understand scientific and religious dynamics more transparently, thereby fostering astronomical literacy and appreciation for the complexity of the hisab-rukyat method. On the other hand, widespread public involvement also has the potential to cause confusion, especially when non-expert opinions are disseminated massively through social media and influence public perception. Religious authorities, which previously held a monopoly on information, now have to contend with a "new authority" in the form of digital communities that are able to build legitimacy through the speed and breadth of information dissemination. This shift confirms that the globalization of astronomical information is not only a technical phenomenon, but also a social transformation that affects patterns of authority, legitimacy, and acceptance of decisions within the global Muslim community.

Positive and Negative Impacts of Astronomical Information Globalization

The globalization of astronomical information has had a significant positive impact, particularly in increasing the literacy of Muslim communities regarding Islamic astronomy. Open access to calculation data, crescent visibility maps, and sighting results means that communities are no longer just recipients of decisions, but can also learn the scientific basis behind the determination of the beginning of the Hijri month. This literacy has given rise to a new awareness that differences in determining the beginning of the month are not merely a matter of "different dates," but are related to differences in methodology, criteria, and sharia interpretations that have academic foundations. Thus,

the globalization of information encourages the public to be more critical, rational, and appreciative of the diversity of astronomical methods that exist in the Islamic world.

In addition, information openness also increases access to global data and expands opportunities for cross-border collaboration. Astronomical experts and religious institutions can now share observation data and calculation results in real time, and even cross-verify with other countries. This collaboration not only strengthens the accuracy of astronomical data, but also opens up space for regional and international harmonization in the formulation of criteria for determining the beginning of the month. A concrete example can be seen in the cooperation between MABIMS (Indonesia, Malaysia, Brunei, and Singapore) in updating the criteria for imkan rukyat, which is influenced by global data flows and discussions (Karim & Mahsun, 2024). With this cross-border access and collaboration, astronomy has evolved into a discipline that is not only scientific but also capable of serving as a bridge for unity among Muslims despite their differences.

Despite its benefits, the globalization of astronomical information also has serious negative impacts, one of which is the proliferation of misinformation. Information related to rukyat results or hisab predictions often circulates widely on social media without adequate scientific verification. For example, claims of seeing the crescent moon from a certain location appear even though it is astronomically impossible, but these claims spread quickly and cause debate in the public sphere. This situation is exacerbated by the tendency for people to believe viral information more quickly than to wait for official clarification from authoritative institutions. As a result, instead of creating literacy and harmony, the globalization of information sometimes triggers confusion and polarization among the community.

In addition to misinformation, bias in information authority has also become a problem that has arisen in the flow of astronomical globalization. Certain sources of information—for example, countries or communities that have more advanced observation technology—are often considered more valid, even though they may not necessarily be relevant to the local context of other countries. On the other hand, official religious institutions sometimes lose their authority because they are slower in communicating decisions than digital communities. This situation creates tension between traditional authorities (the government and religious scholars) and new

authorities (online communities and independent experts). If not managed properly, this bias can lead to fragmentation of authority and weaken the legitimacy of decisions on the determination of the beginning of the Hijri month in the eyes of the public.

The Impact of Globalization on Methods for Determining the Beginning of the Hijri Month: Transformation of the Hisab Method

The transformation of the hisab method in determining the start of the Hijri month is greatly influenced by the integration of modern astronomical criteria developed by international astronomical experts. The criteria for crescent visibility formulated by Yallop (1997) and refined by Odeh (2006), for example, offer a probabilistic approach based on astronomical data and empirical observations from various parts of the world (Soderi et al., 2024) . This formulation not only takes into account the height of the moon or elongation alone, but also other factors such as the age of the moon, illumination, and atmospheric conditions. The integration of these criteria makes the calculation method more scientific, measurable, and closer to the reality of field observations. This also shows that modern astronomy is transforming from mere mathematical calculations to a more empirical discipline based on global data.

At the regional level, the revision of the imkan rukyat criteria by MABIMS (2021) is a concrete example of how the flow of information globalization has influenced official calculation methods. Previously, MABIMS used old criteria that were often criticized for not being in line with observational reality. Now, these criteria have been updated to take into account global data and the latest research results (Aini, 2022). This revision strengthens the credibility of calculation methods in the Southeast Asian region while bringing regional standards closer to international astronomical developments. The integration of these modern criteria demonstrates an effort to harmonize religious authorities with the global scientific community, although in practice there are still challenges when dealing with local traditions and the diversity of fiqh schools in various Muslim countries.

The use of calculation software has become an important milestone in the modernization of methods for determining the beginning of the Hijri month. Various astronomy software such as *Stellarium*, *SkyMap*, *Accurate Times*, and local calculation-

rukyat applications developed by astronomical institutions in Indonesia and other Muslim countries have facilitated the simulation of the positions of the moon and sun. Through this software, experts and the general public can accurately predict the possibility of seeing the crescent moon based on the latest astronomical data, such as the moon's altitude, elongation, illumination, and azimuth. This accessibility marks an important shift: hisab is no longer seen as the exclusive domain of experts, but is open to the general public who want to understand the scientific logic behind the determination of the beginning of the month.

Furthermore, the calculation software also enables the development of a more integrated global data network. By utilizing international databases—such as ephemeris data from NASA or JPL Horizons—the software can generate cross-country crescent visibility maps that serve as a reference for official institutions and astronomy communities. This strengthens the objectivity and consistency of predictions, while also encouraging the creation of more harmonious international standards. However, challenges remain, namely in terms of the compatibility of prediction results with the fiqh standards applicable in each country, as well as the need for field verification through rukyat ( ). Thus, calculation software is not an absolute substitute for observation, but it is an important instrument in consolidating data and strengthening the legitimacy of the method of determining the beginning of the Hijri month in the global era.

Rukyat in the digital age

Rukyat in the digital era has experienced rapid development with the advent of image recording technologies such as DSLR cameras, digital telescopes, and CCD (Charge-Coupled Device) sensors. This technology allows the results of hilal observations to be documented in the form of photos and videos that can be widely shared via the internet and social media (Mohamad et al., 2024) . This provides added value compared to traditional rukyat, which relies solely on verbal testimony, as visual evidence can be verified and reanalyzed by astronomers and authorized institutions. Thus, digital documentation enhances transparency while increasing the credibility of rukyat results in the eyes of the global public.

Furthermore, the real-time dissemination of digital rukyat evidence has created new opportunities for international collaboration. Photos or videos of the crescent moon uploaded from one country can be immediately accessed, compared, and tested by observers in other parts of the world (Zain & Asshiddiqy, 2025). This has given rise to a global ecosystem in which rukyat results are no longer local in nature, but have become part of a shared discourse among Muslims around the world. However, this openness also poses challenges, as not all digital evidence is free from manipulation or technical errors, such as camera noise or misinterpretation of images. Therefore, although the dissemination of digital rukyat evidence increases public literacy and participation, strict scientific verification mechanisms are still needed to ensure that the information circulating is truly valid and can be used as a basis for decision-making.

One of the main challenges of rukyat in the digital age is the issue of data authentication compared to local testimony. Visual evidence in the form of widely circulated photos or videos of the crescent moon is often considered more scientifically valid, but in the tradition of fiqh, direct testimony from reliable eyewitnesses remains important. This creates a dilemma: should the authorities responsible for determining the start of the month prioritize digitally verified astronomical data, or should they stick to local testimony even if the crescent moon is scientifically impossible to see? The tension between religious authorities based on syahadah (testimony) and the scientific community demanding measurable empirical evidence often leads to differing decisions in various countries.

Furthermore, the process of authenticating digital data is not straightforward. For example, photos of the crescent moon taken with a sensitive camera may show a faint light that resembles the crescent moon, when in fact it is an optical artifact or atmospheric disturbance. Similarly, online reports of sightings that spread quickly without verification have the potential to cause public confusion. Meanwhile, local testimonies are not immune to weaknesses, such as human visual perception errors, psychological biases, or social pressure. Thus, a major challenge for the digital age is how to formulate verification standards that can integrate digital evidence with local testimonies, so that decisions on the start of the Hijri month remain scientifically and religiously legitimate.

Hybridization of the Hisab-Rukyat Methods in Official Decisions.

The hybridization of methods in determining the beginning of the Hijri month emerged as a response to the tension between the Hisab and Rukyat approaches. In practice, many Muslim countries choose not to rely solely on one method, but to combine the two so that the decisions made have both scientific and religious legitimacy. Hisab serves as the basis for predicting the possibility of seeing the crescent moon, while Rukyat serves as empirical verification in the field. This combination model allows for a more measurable determination process, as rukyat results can be tested against hisab references, while hisab obtains validation through real observation (Taufiqurachman et al., 2024). Indonesia, for example, implements an isbat session that combines hisab results from various mass organizations and falak institutions with rukyat reports from a number of observation points.

The combination of hisab and rukyat in official decisions also reflects an adaptation to the development of information globalization. Rapidly disseminated digital rukyat reports can be compared with modern hisab results based on international criteria such as Odeh or the MABIMS revision, thereby strengthening the accuracy and consistency of the data (Sari & Natalia, 2024). However, this hybridization still faces challenges, especially when the results of rukyat and hisab predictions do not align. In such conditions, religious authorities usually become the final decision-makers, considering both scientific aspects and applicable fiqh norms. Thus, the hybridization of methods is not merely a technical compromise, but also a strategy to maintain authority, harmony, and socio-religious legitimacy in the era of information globalization.

Global data plays an important role in strengthening the legitimacy of domestic authorities in determining the beginning of the Hijri month. Public access to international crescent visibility maps, rukyat reports from various parts of the world, and astronomical software-based hisab simulations allows domestic authorities to have more comprehensive scientific references. With the support of global data, a country's official decision can be seen as part of an international scientific consensus, not just a local claim. This increases the credibility of the decision in the eyes of the public and reduces the potential for criticism that the authorities are relying solely on limited views or local traditions.

However, the openness of global data can also weaken domestic authorities when official decisions differ from widely disseminated international information. For example, if global astronomical data shows that the crescent moon is impossible to see, but local authorities accept eyewitness testimony, the public will easily doubt the authorities because their access to information is much broader. The lack of synchronization between domestic decisions and global data often leads to public debate and even triggers the fragmentation of religious authorities. In the context of information globalization, the biggest challenge for domestic authorities is how to manage global data so that it continues to strengthen legitimacy rather than weakening the authority and trust of the community.

Variations in the Determination of the Beginning of the Hijri Month in Various Countries: Implementation of the New Imkan Rukyat Criteria (Neo MABIMS).

In 2021, the MABIMS countries (Indonesia, Malaysia, Brunei, and Singapore) agreed to use new imkan rukyat criteria that are stricter than before. These new criteria stipulate that the crescent moon is considered visible if it has a minimum height of 3° with an elongation of 6.4° or a minimum age of 8 hours at sunset. The application of these criteria is the result of lengthy scientific studies and a response to developments in more accurate modern astronomical methods (Wayuningsih, 2024). With these new standards, MABIMS countries are striving to create regional uniformity in determining the start of the Hijri month, particularly Ramadan, Shawwal, and Dhu al-Hijjah, thereby reducing potential differences among communities in Southeast Asia.

However, the implementation of these new imkan rukyat criteria still faces a number of challenges. In Indonesia, for example, several Islamic organizations have different views, such as Muhammadiyah, which uses hisab hakiki wujudul hilal with different parameters. This has led to a situation where the determination of the beginning of the month still has the potential to differ even though the government has committed to the MABIMS criteria. Meanwhile, in Malaysia and Brunei, the implementation of these criteria is relatively easier because religious authorities are more centralized. Differences in acceptance among communities show that although the new MABIMS imkan rukyat criteria are a major step forward in regional Islamic calendar integration, full

harmonization at the domestic and international levels still requires a long-term process of socialization and consensus.

Saudi Arabia uses the Umm al-Qura Calendar and official rukyat.

Saudi Arabia uses the Umm al-Qura calendar as an administrative and social reference, but the determination of the beginning of the Hijri month for worship is still determined through official sightings approved by the Supreme Court. The Umm al-Qura calendar is compiled based on astronomical calculations, specifically the criteria of conjunction before sunset in Mecca, so that dates in the calendar are often set well in advance. However, to determine the beginning of Ramadan, Shawwal, and Dhu al-Hijjah, the government still waits for sighting reports from witnesses scattered across various strategic locations (Musonnif, 2015). This mechanism highlights the dualism between the calendar's administrative functions and religious decisions regarding worship. Nevertheless, this system often sparks global controversy, particularly when the sighting results accepted in Saudi Arabia are deemed inconsistent with international astronomical predictions, leading to discrepancies in the start of the month compared to other countries.

Turkey, Use of Modern Astronomical Calculations by Diyanet.

Turkey, through its official institution, the Presidency of Religious Affairs (Diyanet İşleri Başkanlığı), determines the start of the Hijri month solely based on modern astronomical calculations without waiting for sighting reports. Diyanet uses international crescent visibility criteria calculated with advanced astronomical software, as well as referring to globally recognized standards for lunar elongation and altitude (Jayadi et al., 2025a). With this method, Turkey can determine the Hijri calendar well in advance, even years ahead, so that the public has certainty in planning worship and social activities. This calculation-based approach also makes Turkey one of the pioneers in modernizing the determination of the beginning of the month in the Islamic world, while offering an alternative model for other countries that still rely on rukyat as the primary source of determination.

Morocco, Traditional Rukyat System Based on a Network of Official Observers.

Morocco maintains its traditional rukyat system by establishing an official observer network spread across more than 200 observation points throughout the country. At the beginning of each Hijri month, observers appointed by the Ministry of Endowments and Islamic Affairs simultaneously conduct hilal rukyat and report their findings to the central authority for verification. This model emphasizes direct visual testimony as the basis for determining the start of the month, ensuring that decisions made carry both religious legitimacy and authority in the eyes of the public (Zaman, 2021). The advantage of this system is national consistency, as decisions on the start of the month are made centrally by the government based on official reports, not on claims by individuals or specific groups. However, this traditional approach sometimes causes Morocco to differ from other countries that use modern astronomical calculations, particularly in determining the start of Ramadan and Eid al-Fitr.

Pakistan and Nigeria, Central-Regional Combination-Based Determination Committee Model.

Pakistan and Nigeria both use a central-regional combination-based determination committee model, in which decisions on the beginning of the Hijri month are made through coordination between central authorities and rukyat reports from various regions. In Pakistan, the National Ru'yat e Hilal Committee receives reports from the provinces before announcing an official decision, while in Nigeria, the New Moon Determination Commission, which is under federal religious authority, compiles sighting reports from a network of regional scholars. This system seeks to combine the religious legitimacy of local testimony with centralized national authority, resulting in decisions that carry representative weight. However, this combined model often faces challenges in the form of differing reports between regions and political-religious tensions, which sometimes cause delays in announcements and inconsistencies in practices among Muslims (Nawawi et al., 2024).

Muslim Communities in Europe & America (FCNA, ECFR).

Muslim communities in Europe and America generally tend to adopt the astronomical calculation method in determining the beginning of the Hijri month, due to

geographical and sociological conditions that make it difficult to carry out rukyat simultaneously and in a coordinated manner. Institutions such as *the Fiqh Council of North America* (FCNA) and *the European Council for Fatwa and Research* (ECFR) are the main references, setting criteria for conjunction (ijtima') before sunset and global visibility of the crescent moon. This approach provides certainty of the schedule well in advance, which is urgently needed by Muslim minorities in the context of planning worship, education, and work. However, the dominance of this calculation method has also sparked internal debate, especially with some groups who still insist on local sightings, so that differences in the start of the month still often occur among the Muslim diaspora (Musonnif, 2018).

Globally, differences in methods for determining the beginning of the Hijri month reflect the dynamics of interaction between classical fiqh traditions, national religious authorities, and the influence of modern astronomical information globalization. MABIMS countries have attempted regional harmonization by establishing new imkan rukyat criteria, while Saudi Arabia still relies on a combination of administrative hisab calendars and official rukyat. Conversely, Turkey and Muslim communities in Europe–America emphasize certainty through modern astronomical calculations, while Morocco and Pakistan–Nigeria maintain the legitimacy of rukyat with variations of traditional models and central-regional committees. This diversity of approaches indicates that there is no single consensus in the Islamic world, despite the increasing global accessibility of astronomical information.

The globalization of astronomical information plays an important role in accelerating the flow of comparisons and critiques of the methods used by various countries. Differences between international calculations and local sighting claims in Saudi Arabia, for example, often trigger global discourse on social media and scientific forums. Similarly, decisions made by MABIMS or Turkey's Diyanet are now directly compared and analyzed by the public across countries, indicating the existence of a "global discourse space" that brings together local, regional, and international perspectives. This phenomenon indicates that traditional authorities in determining the beginning of the month no longer stand alone, but must face demands for transparency,

scientific rationalization, and expectations of uniformity among the ummah in the digital age.

Thus, variations in determining the beginning of the Hijri month in various countries are not only a matter of technical differences in hisab and rukyat, but also a reflection of religious authority, political legitimacy, and the influence of information globalization. The emerging pattern shows three major trends: (1) a traditional approach based on rukyat (Morocco, parts of Pakistan-Nigeria), (2) a combinative approach of hisab-rukyat (MABIMS, Saudi Arabia), and (3) a modern approach based on full astronomical hisab (Turkey, Western Muslim communities). Although the globalization of information encourages consolidation towards more universal scientific standards, the diversity of authorities and the socio-political contexts of each country make global uniformity difficult to achieve in the near future.

Implications of Information Globalization on Convergence and Divergence

The globalization of information in the field of astronomy opens up significant opportunities for the unification of the global Hijri calendar, as astronomical data is now widely accessible, accurate, and available in real-time to various countries and Muslim communities around the world. The development of calculation software, crescent visibility maps, and digital rukyat reports enables the creation of a shared database that can be used as a universal reference. With this transparency of information, differences in criteria can be narrowed through scientific dialogue between religious authorities and astronomical institutions, creating the potential for unifying the start of Ramadan, Shawwal, and Dhu al-Hijjah. Unifying the Hijri calendar not only facilitates the planning of worship and social activities across countries, but also strengthens the solidarity of Muslims on a global scale.

The main obstacle in the effort to harmonize the global Hijri calendar lies in the fundamental differences in fiqh between schools of thought and religious authorities (Angkat, 2017). Some countries and scholars emphasize the importance of local rukyat as a valid requirement for determining the beginning of the month, while others accept global hisab or international rukyat as a reference. Differences in interpretation of the hadiths on rukyat, the criteria for imkan rukyat, and the requirements for hilal testimony

have created an authoritative fragmentation that is difficult to bridge. In addition, some communities still consider hisab to be only an aid, not a basis for determining law, so resistance to unification based on modern astronomy remains strong.

Beyond fiqh issues, political factors and state authority also pose serious obstacles to harmonization. The determination of the beginning of the Hijri month is often used as a symbol of religious sovereignty and national identity, so the government is reluctant to surrender its authority to international institutions or the global consensus of the International Islamic Astronomical Union. For example, Saudi Arabia with the Umm al-Qura calendar, or Morocco with the traditional rukyat system, affirm the domestic model as part of political and social legitimacy. Even in the MABIMS forum, despite the agreement on new rukyat criteria, its implementation still faces variations in practice in each country. This shows that harmonization is not merely a technical-astronomical issue, but is also related to the complex dynamics of power, sovereignty, and religious authority.

Differences in determining the beginning of the Hijri month often cause significant social resonance among Muslims. On the one hand, some people view these differences as a form of legitimate diversity of ijtihad in Islamic tradition, so they can accept the differences with tolerance. However, for others, especially those in urban environments and connected to the flow of information globalization, these differences are perceived as a sign of weakness among Muslims in building symbolic unity. Social media has accelerated the spread of opinions, both those supporting unification and those criticizing differences, so that public discourse is often more emotional than rational.

On the other hand, this social resonance also has an impact on the daily practices of Muslims, especially in the implementation of collective worship, such as Eid al-Fitr or Eid al-Adha prayers. Differences in determining the beginning of the month can divide families, communities, and even societies in celebrating religious holidays, which should be a moment of unity. This situation causes unrest, especially in countries with Muslim minorities, because Muslims must choose which authority to follow. This phenomenon shows that the Hijri calendar problem is not only a technical issue of astronomy or fiqh, but also concerns social cohesion and the symbol of unity among Muslims in the era of information globalization.

Classical astronomical studies, such as those conducted by Ilyas (1984), Yallop (1997), and Odeh (2004), generally focus on refining or improving the criteria for crescent visibility based on a mathematical-astronomical approach. Ilyas emphasized the need for more realistic imkan rukyat criteria by considering the variables of elongation and crescent height. Yallop then developed a probabilistic model based on global rukyat data to produce more accurate predictions, while Odeh introduced *the New Criterion*, which utilizes modern observation technology and astronomical software simulations. Although contributing significantly to the accuracy of hisab, these studies focused more on astronomical technical aspects without deeply examining the social and political implications, as well as the dynamics of information globalization, on the acceptance of the community and religious authorities in determining the beginning of the Hijri month.

Studies *on* domestic policy, such as research conducted by Djamaluddin (2010, 2016) and official documents from MABIMS (Ministers of Religious Affairs of Brunei, Indonesia, Malaysia, and Singapore), focus on efforts to build consensus on criteria for determining the start of the Hijri month at the regional level. Djamaluddin emphasizes the importance of integration between religious and astronomical authorities in producing more credible decisions, while MABIMS is gradually revising the imkan rukyat criteria to align with modern astronomical developments. These studies highlight internal dynamics within a country or region, including fiqh, political, and public acceptance factors, but have not explored how the flow of digital information globalization can influence these domestic authorities or open up space for the public to directly compare the results of hisab and rukyat from various countries.

Normative fiqh studies, as seen in the fatwas of *the Fiqh Council of North America* (FCNA) and the European Council for Fatwa and Research (ECFR), focus on the legitimacy of using modern astronomical calculations as the basis for determining the beginning of the Hijri month. The FCNA, for example, has emphasized since the early 2000s the importance of a calculation-based calendar standard for legal certainty in Sharia for Muslim minority communities in America, while the ECFR asserts that calculations can be used as the main basis while still paying attention to the principles of maqāṣid al-syarī'ah, especially the benefit of the community. These studies emphasize textual arguments and usul al-fiqh, thus placing more emphasis on religious legal authority than

on social dynamics or the influence of information globalization. Thus, this research tends to ignore the interaction between the development of global communication technology and the community's acceptance of transnational fiqh decisions.

The novelty of this research lies in placing the globalization of information as the main explanatory variable in the dynamics of determining the beginning of the Hijri month, an aspect that has not been widely touched upon in previous studies. While classical studies emphasize purely astronomical aspects, domestic policy research highlights state authority, and normative fiqh studies focus on legal legitimacy, this study attempts to bridge the three by examining how digital information flows—through the internet, social media, astronomy applications, and the dissemination of global hisab and rukyat data—influence communication patterns, religious authority, and the perceptions of people across countries. Thus, this research not only enriches the field of astronomy studies but also opens up interdisciplinary space with communication studies, sociology of religion, and global studies, thereby providing a more comprehensive explanation of the convergence and divergence in determining the start of the Hijri month in the global era.

CONCLUSION

Based on the above description, it can be concluded that the globalization of information in the field of Islamic astronomy has brought about significant transformations in the methods used to determine the beginning of the Hijri month. Advances in information technology, public access to hisab and rukyat data, and the shift in communication patterns from limited authorities to the global public have changed the landscape of authority and practices in determining the Hijri calendar. The integration of modern astronomical criteria, the use of software, and the dissemination of digital rukyat evidence confirm the hybridization of hisab and rukyat methods in various official decisions. Variations in practices in Muslim countries, ranging from MABIMS, Saudi Arabia, Turkey, Morocco, Pakistan, to Muslim communities in Europe and America, show that information globalization not only accelerates data exchange but also strengthens the dialectic between domestic authorities and transnational dynamics.

However, the globalization of information also has two implications: on the one hand, it opens up opportunities for the unification of the global Hijri calendar through cross-country collaboration and increased public literacy, but on the other hand, it presents challenges in the form of differences in fiqh (Islamic jurisprudence), the political authority of the state, and the risk of misinformation. The social resonance arising from differences in determination often causes confusion among the people, but it also encourages awareness of the importance of more inclusive scientific, fiqh, and technological dialogue. Thus, this study offers a novel approach by using the variable of information globalization as the main explanatory factor, which complements astronomical research, normative fiqh, and domestic policy, thereby providing a comprehensive picture of the convergence and divergence of Hijri month determination in the digital age.

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