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Bibliometric Analysis of Religious Communication in the Digital Age: Mapping the Scholarly Landscape from Mosque to Metaverse (2015-2024)

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Abstract:

The 21st century's digital transformation is profoundly reshaping religious communication, migrating practices from physical spaces like mosques to digital and immersive environments. This study conducts a comprehensive bibliometric analysis to map the scholarly evolution of religious communication, specifically focusing on the transition from traditional settings to virtual reality (VR) and the Metaverse between 2015 and 2024. Using data from 565 Scopus-indexed publications, this research employs co-citation and bibliographic coupling analyses in VOSviewer to identify the field's intellectual structure and emerging research fronts. The findings reveal a diverse knowledge base, anchored in foundational theories like Bourdieu's social concepts and key technological frameworks from Augmented Reality (AR) to real-time spatial computing. Contemporary research clusters are converging around AI-driven intelligent systems and digital frameworks for heritage preservation. Despite this growth, the field is limited by a reliance on English-language, Open Access literature. The study concludes by proposing a multi-faceted future research agenda, urging exploration into the ethical integration of AI and IoT in religious practice, the development of faith-specific AR/VR frameworks, the establishment of religious UX principles, and the empirical measurement of "digital religious capital" within new algorithmic authority structures.

Keyword: Bibliometric Analysis, Religious Communication, Metaverse, Virtual Reality, Digital Da'wah, Virtual Mosque, Co-citation, Bibliographic Coupling

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Introduction

The 21st century has been defined by an unprecedented digital transformation, fundamentally reshaping the fabric of human interaction and community formation. This technological revolution extends its influence beyond secular domains, profoundly impacting spiritual and religious spheres (Campbell, 2020). Religious communication, once anchored in physical spaces like mosques, churches, and temples, is now increasingly

migrating to and engaging with digital environments. This transition signifies a new phase where religious authority, community building, and ritual practices are being challenged and reconfigured, necessitating a systematic scholarly effort to map this dynamic evolution and understand how new technologies are reshaping the dissemination and reception of religious messages.

Within the Islamic context, the practice of *dakwah*, or proactive religious communication, encounters unique opportunities and challenges in this digital era. While the mosque has historically served as the epicenter for preaching and community formation, digital spaces offer instantaneous global reach. Previous research has begun exploring the use of social media platforms like YouTube and Twitter for *dakwah*, creating what scholars term "cyber-Islamic environments" (Bunt, 2018). However, the technological landscape is rapidly evolving beyond these two-dimensional platforms towards more immersive realms. The emergence of Virtual Reality (VR), Augmented Reality (AR), and the concept of the Metaverse promises more participatory and sensory-rich religious experiences, potentially redefining understandings of communal presence and ritual (Cheong, 2020).

Immersive technologies like VR and the Metaverse introduce a novel dimension to religious communication. The Metaverse, conceptualized as a persistent network of 3D virtual worlds, enables the creation of "virtual mosques" or spiritual environments where individuals from across the globe can congregate, worship, and learn without geographical constraints (Grieve & Veidlinger, 2022). Although still nascent, empirical research is beginning to demonstrate the potential of VR to foster authentic religious experiences and influence user spirituality (Klaassen et al., 2021). Consequently, variables such as "Mosque" (symbolizing tradition), "VR" (as the enabling technology), and "Metaverse" (as the destination ecosystem) represent crucial nodes in the contemporary research landscape. Mapping the relationships and developmental trajectories of these concepts within academic literature is a vital step for forecasting the future directions of digital religious propagation.

Despite growing academic interest in the intersection of religion and technology, a significant research gap persists. Most existing studies are qualitative, focused on specific case studies, or limited to social media analysis (Riyanto & Widyaningrum, 2019). There is a scarcity of systematic literature reviews that quantify the volume, trends, and collaborative patterns of research on religious communication within immersive environments. A bibliometric analysis is uniquely positioned to address this gap. This method allows for the statistical examination of large publication datasets, enabling the identification of emerging research fronts, intellectual networks, and the impact of pivotal works, thereby providing a macro-level overview that is difficult to achieve through traditional literature reviews (Zupic & Čater, 2015).

Therefore, this study aims to conduct a comprehensive bibliometric analysis to map the scholarly landscape of religious communication, with a specific focus on its transition from physical spaces (Mosque) to virtual realms and the Metaverse between 2015 and 2024. By analyzing publication trends from 2015 to 2024, this research seeks to identify evolving thematic clusters, the most productive countries and institutions, collaboration patterns, and dominant intellectual discourses. Centered on the core variables of "religious communication," "mosque," "VR," and "metaverse," this paper will address the research question: How has the field of *dakwah* in virtual environments and the metaverse evolved over the past five years, and what are the future implications of this mapping for the theory and practice of Islamic broadcasting communication?

Methodology

This study employed a comprehensive bibliometric analysis to map the intellectual structure and evolution of research on religious communication in the digital age. The analysis was conducted using data extracted from the Scopus database, renowned for its extensive coverage of high-quality, peer-reviewed literature (Baas et al., 2020). Data retrieval was executed on [Insert Date] to ensure temporal consistency. A systematic search query was constructed to capture the core themes of the research, integrating keywords related to digital platforms, religious practice, and emerging technologies. The final query used was: TITLE-ABS-KEY ("virtual reality" OR "vr" OR "metaverse" OR "religious communication" OR "digital religion" OR "da'wah" OR "islamic preaching" OR "virtual worship" OR "online religion"). This deliberate combination of terms was designed to encompass the multifaceted dimensions of the phenomenon, ranging from the digitization of traditional preaching ("da'wah") to the frontier of immersive spiritual experiences ("metaverse").

To delineate a coherent and contextually rich corpus, several refining filters were applied to the initial search results. The publication period was constrained to the years 2015–2024 to capture the most recent decade of scholarly output, a period characterized by the rapid adoption of technology in religious life, significantly accelerated by the global COVID-19 pandemic. Geographically, the analysis was focused on five specific countries: Indonesia, Pakistan, Iran, Afghanistan, and Taiwan. This selection was strategic; the first four nations represent contexts with significant Muslim populations where the concepts of "da'wah" and "islamic preaching" are highly salient, thereby enabling an in-depth examination of Islamic digital religious communication. The inclusion of Taiwan provides a comparative perspective from a non-Muslim-majority society with high digital penetration, potentially revealing distinct patterns of "digital religion" and "virtual worship". Furthermore, the study was restricted to "All Open Access" journal articles published in English. The Open Access criterion ensures the reproducibility of this study and enhances the inclusivity and global reach of its findings (Piwowar et al., 2018), while the limitation to journal articles and the English language guarantees that the analysis is built upon a foundation of formally published, internationally communicative, and peer-reviewed research.

The application of these filters yielded a final corpus of 565 documents. This dataset was exported in CSV and RIS formats, containing complete bibliographic records for each publication. The data were subsequently imported into VOSviewer software, a specialized tool for constructing and visualizing bibliometric networks (van Eck & Waltman, 2010). VOSviewer was utilized to perform two primary types of analysis to address distinct research inquiries. First, a **co-citation analysis** was conducted to map the intellectual foundations of the field. This analysis clusters frequently cited reference documents, thereby revealing the foundational theories and seminal works that underpin scholarly discourse on religious communication in the digital age, as visualized in Figure 2. Second, a **bibliographic coupling** analysis was performed on the 565 source documents to map the current research fronts and thematic trends. This method links documents that share common references, effectively grouping contemporary studies that are engaging with analogous literature and, by extension, similar research problems (Kessler, 1963), as depicted in Figure 3.

The rationale for this methodological design is directly substantiated by the research objectives and the resultant visualizations. The stringent country filter creates a well-defined scholarly domain, facilitating a nuanced understanding of how this global phenomenon manifests in specific regional and religious contexts. The significant surge in publications from 2020 onwards, as vividly illustrated in the annual trend graph (Figure 1), validates the timeliness of this study and aligns with global events that necessitated a shift of religious activities to online spaces. The co-citation network (Figure 2) serves to uncover the key theoretical pillars—whether from media studies, the sociology of religion, or computer science—upon which scholars in

this domain draw. Concurrently, the bibliographic coupling network (Figure 3) reveals the current, active research clusters, such as studies focusing on "virtual reality" for "virtual worship" or analyses of "da'wah" on social media platforms, demonstrating how the intellectual foundation is being applied in contemporary, cutting-edge research.

In conclusion, this methodology provides a robust, multi-faceted framework for analyzing the evolution and structure of research on religious communication in the digital age. By combining systematic data collection from a reputable database with advanced network analysis techniques, this study moves beyond a simple descriptive summary to provide a nuanced, visual, and interpretative mapping of the scholarly landscape. The integration of trend analysis, intellectual structure mapping (co-citation), and research front mapping (bibliographic coupling) offers a comprehensive overview, tracing the field's growth, its foundational knowledge, and its emerging frontiers from traditional settings to the metaverse.

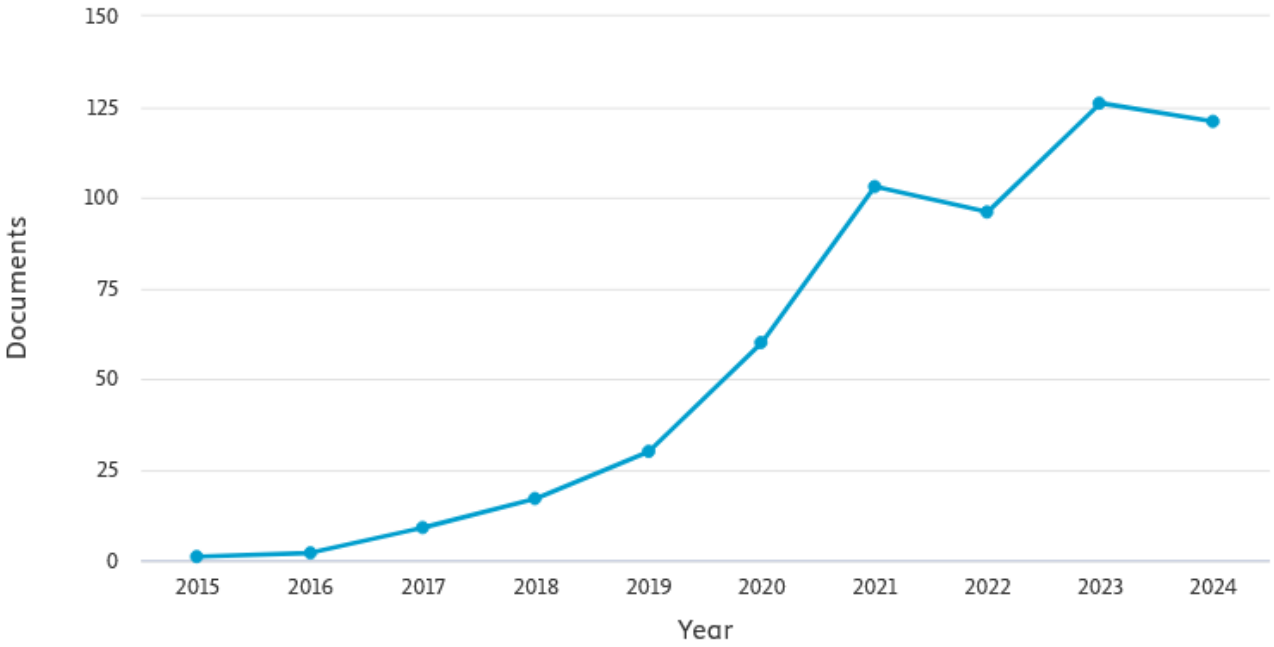

Figure 1. Document Year

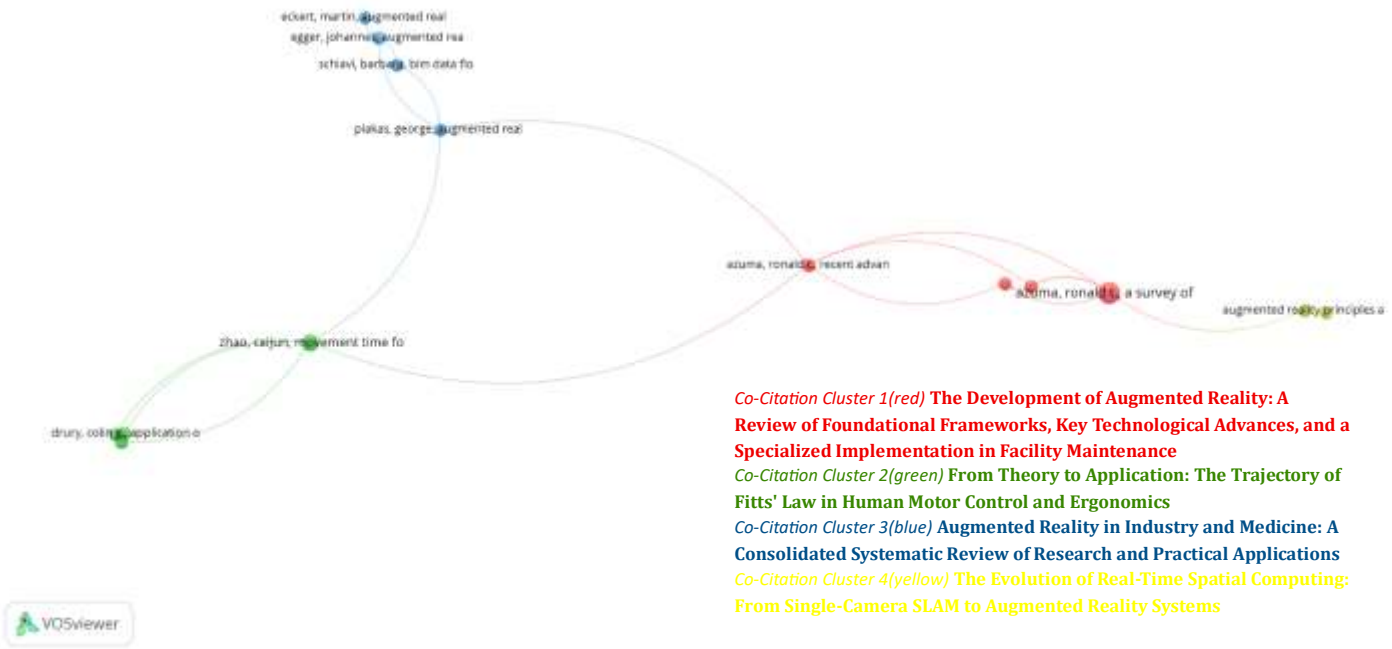

Figure 2. Network

Knowledge Base Religious Communication in the Digital Age

Co-citation analysis procedure

The co-citation cluster analysis in this study was conducted following established bibliometric protocols to map the intellectual structure of research on religious communication in the digital age. The procedure commenced with data extraction from Scopus, utilizing a comprehensive search query incorporating key terms such as "metaverse," "digital religion," and "Islamic preaching," which yielded an initial corpus of publications. Following the methodology outlined by Zupic and Čater (2015), the reference lists of these publications were analyzed to construct a co-citation matrix. This matrix quantified the frequency with which pairs of cited documents (references) appeared together in the bibliographies of the citing articles. The strength of the co-citation link between two references is a proxy for their thematic relatedness, suggesting they form part of a shared conceptual foundation. VOSviewer software, a specialized tool for constructing and visualizing bibliometric networks, was employed to process this matrix (van Eck & Waltman, 2010). The software's clustering algorithm then grouped frequently co-cited references into distinct clusters based on the density of their connections, with each cluster, visualized by a unique color (e.g., Red, Green, Blue, Yellow), representing a specific school of thought or a foundational thematic area within the broader field.

The interpretation of the resulting clusters, including the four primary ones identified—Augmented Reality foundations (Red), Fitts' Law applications (Green), Bourdieu's social theory (Blue), and Spatial Computing evolution (Yellow)—involved a qualitative examination of the seminal works within each group. The intellectual core of each cluster was defined by the documents with the highest co-citation link strength, as these represent the most central and influential references for that particular thematic group. For instance, the robust cluster around Bourdieu's work emerged from the high frequency with which his theories on capital and habitus were jointly referenced by scholars analyzing power dynamics in digital religion. This analytical procedure, combining quantitative network analysis with qualitative interpretation, effectively unveils the

underlying intellectual pillars that support contemporary research. It successfully maps how diverse theoretical and technological foundations, from sociological theory to human-computer interaction and computer vision, converge to structure the scholarly discourse on the transition of religious communication from traditional settings to the metaverse.

Cluster 1 (Red) ***The Development of Augmented Reality: A Review of Foundational Frameworks, Key Technological Advances, and a Specialized Implementation in Facility Maintenance***

Based on the provided co-citation data, **Cluster 1 (Red)** constitutes a foundational pillar for the scholarly understanding of immersive digital environment technologies within the research domain. This cluster is centrally focused on the developmental trajectory, core technological frameworks, and practical implementation of **Augmented Reality (AR)**, thereby positioning it as a critical precursor and enabling technology for more complex digital realms such as the metaverse. The cluster is anchored by the seminal work of Azuma (1997), whose survey established the fundamental definitions and conceptual framework for AR, and his subsequent publication (Azuma, 2013), which chronicled significant technological advancements in the field. This theoretical and technological foundation is then operationalized through specialized, real-world application, as demonstrated by Koch et al. (2014), whose research on AR for indoor navigation and facility maintenance provides a concrete case study of its practical utility.

The trajectory delineated by this cluster's key documents reveals a coherent narrative of progression from theoretical foundation to domain-specific application. It originates with the establishment of AR's core principles (Azuma, 1997), advances through its ongoing technological maturation (Azuma, 2013), and culminates in a specialized use-case that validates its practical value in the management of physical infrastructure (Koch et al., 2014). Within the broader context of the bibliometric analysis on religious communication, this cluster signifies that AR is recognized as a substantive technological framework. Scholars in the field likely draw upon this foundational knowledge to conceptualize and substantiate research into how augmented digital layers can be integrated into physical religious spaces (e.g., mosques or churches) for purposes such as enhanced visitor navigation, contextual information delivery, or heritage preservation. Consequently, this cluster represents a crucial technological nexus connecting traditional physical worship with the emerging paradigms of the digital age.

Cluster 2 (Green) ***From Theory to Application: The Trajectory of Fitts' Law in Human Motor Control and Ergonomics***

Cluster 2 (Green) represents a fundamental research stream examining the principles of human-computer interaction (HCI), specifically focusing on the application of Fitts' Law. This cluster delineates the complete trajectory of a seminal psychological theory from its original conceptualization to its practical implementation in ergonomic design. The cluster is anchored by the pioneering work of Fitts (1954), who established the fundamental model for understanding the information capacity of the human motor system, later refined in Fitts (1964). This theoretical foundation was subsequently operationalized in a practical engineering context by Drury (1975), who demonstrated its direct application to foot-pedal design, thereby validating its utility in optimizing the efficiency and accuracy of human movement in controlled environments.

Within the broader bibliometric analysis of religious communication in the digital age, the prominence of this cluster carries significant implications. It indicates that scholarly work in this field extends beyond content and theological considerations to engage deeply with the usability and ergonomics of digital religious interfaces. The principles of Fitts' Law, which predict the time required to acquire a target, are fundamental to designing intuitive and effective interactive elements. Consequently, researchers likely reference this cluster to inform the design of user interactions in virtual worship spaces, digital prayer applications, or interfaces for navigating online religious content. The presence of this cluster underscores that the efficacy of "digital religion" is partially

contingent upon how well its technological platforms align with fundamental principles of human motor control, thereby ensuring that digital religious practices remain accessible, efficient, and minimize unnecessary physical or cognitive load.

Cluster 3 (Blue) ***Augmented Reality in Industry and Medicine: A Consolidated Systematic Review of Research and Practical Applications***

Cluster 3 (Blue) constitutes a fundamental theoretical framework for examining the sociological dynamics of power, distinction, and cultural practice, centered upon the seminal contributions of Pierre Bourdieu. This cluster delineates the core conceptual architecture of Bourdieusian sociology, tracing the development and implementation of pivotal constructs including habitus, capital, and field. The cluster is anchored by Bourdieu's foundational text (2020), which systematically introduces these conceptual tools, explicating how habitus—understood as deeply internalized dispositions—operates subconsciously to structure individual agency and practice. This theoretical foundation receives further elaboration through his analysis of aesthetic judgment (Bourdieu, 1984), which demonstrates how taste functions not as an expression of innate preference but as a potent mechanism for social stratification and cultural reproduction. The empirical application of this theoretical apparatus is exemplified in Bourdieu (1988), which scrutinizes the academic universe as a specific social field characterized by intense competition for various species of capital.

Within the context of the bibliometric analysis concerning religious communication in the digital age, the pronounced prominence of this cluster carries profound implications. It furnishes an indispensable theoretical lens for analyzing the processes through which religious authority, symbolic power, and cultural capital are reproduced, contested, and reconfigured within emerging digital religious fields. Scholars undoubtedly draw upon this cluster to investigate the negotiation of traditional religious authority in online environments, the constitution of novel forms of digital religious capital (e.g., algorithmic visibility, viral content), and the manner in which the specific habitus of religious communities conditions their engagement with digital platforms, including nascent metaverses. The considerable co-citation strength, particularly for works articulating the concepts of habitus and capital, underscores the academic consensus that comprehending the durable social structures and embodied dispositions of religious agents is paramount to deciphering the complex power dynamics inherent in the digitization of religious life, thereby elevating the analysis beyond a mere chronicle of technological adoption to a more profound level of sociological critique.

Table 1

TOP 3 DOCUMENTS FOR CO-CITATION REFERENCES CLUSTERS

Cluster Co-Citation	Authors (Years)	Sources	Document Description of Secondary Sources	Co-Citation Strength
Cluster 1 (Red) **The Development of Augmented Reality: A Review of Foundational Frameworks, Key Technological Advances, and a Specialized Implementation in Facility Maintenance**	Azuma (1997)	Presence: Teleoperators and Virtual Environments	A Survey of Augmented Reality	5
	Azuma (2001)	IEEE Computer Graphics and Applications	Recent Advances in Augmented Reality	5

	Koch (2014)	Automation in Construction	Natural markers for augmented reality-based indoor navigation and facility maintenance	3
Cluster 2 (Green) **From Theory to Application: The Trajectory of Fitts' Law in Human Motor Control and Ergonomics**	Drury (1975)	Human Factors	Application of Fitts' Law to Foot-Pedal Design	5
	Fitts (1964)	Journal of Experimental Psychology	Information capacity of discrete motor responses	5
	Fitts (1954)	Journal of Experimental Psychology	The information capacity of the human motor system in controlling the amplitude of movement	5
Cluster 3 (Blue) **Augmented Reality in Industry and Medicine: A Consolidated Systematic Review of Research and Practical Applications**	Eckert (2019)	JMIR mHealth and uHealth	Augmented reality in medicine: Systematic and bibliographic review	1
	Egger (2020)	Computers & Industrial Engineering	Augmented reality in support of intelligent manufacturing – A systematic literature review	3
	Plakas (2020)	Procedia Manufacturing	Augmented Reality in Manufacturing and Logistics: Lessons Learnt from a Real-Life Industrial Application	4
Cluster 4 (Yellow) **The Evolution of Real-Time Spatial Computing: From Single-Camera SLAM to Augmented Reality Systems**	Dieter (2016)	Addison-Wesley	Augmented Reality: Principles and Practice	2
	Davison (2007)	IEEE Transactions on Pattern Analysis and Machine Intelligence	MonoSLAM: Real-time single camera SLAM	1

Cluster 4 (Yellow) ***The Evolution of Real-Time Spatial Computing: From Single-Camera SLAM to Augmented Reality Systems***

Cluster 4 (Yellow) represents a critical technological lineage focused on the core enabling technologies for spatial computing and augmented reality. This cluster maps the progression from foundational algorithms for environmental perception to integrated systems for interactive AR applications. It is anchored by the seminal work of Davison et al. (2007), which established MonoSLAM as a breakthrough in real-time simultaneous localization and mapping (SLAM) using a single camera, thereby providing a fundamental solution for a device to understand and track its position within a three-dimensional space in real-time. This core algorithmic advancement is subsequently synthesized into a comprehensive framework for practical implementation by Dieter (2016), whose work on AR principles and practice translates these computational foundations into the design principles and systemic architectures that underpin functional augmented reality experiences.

Within the broader bibliometric analysis of religious communication in the digital age, the presence of this cluster is highly indicative of the field's engagement with advanced immersive technologies. It signifies that scholarly discourse extends beyond conceptual discussions of the metaverse to a grounded investigation of the underlying computational machinery required to create persistent, interactive digital overlays on the physical world. Researchers in digital religion likely draw upon this cluster to inform studies on the technical feasibility and user experience of spatially-aware religious applications, such as AR applications that overlay historical religious information onto physical sacred sites, or the development of shared virtual worship spaces that require robust real-time spatial mapping to foster a sense of co-presence. Thus, this cluster highlights that the evolution of digital religious practices, from augmented reality-enhanced pilgrimages to metaverse mosques, is intrinsically linked to the ongoing advancements in real-time spatial computing and SLAM technologies that these foundational works represent.

Study Limitations Religious Communication in the Digital Age

Bibliographic Coupling Analysis Procedure

The bibliographic coupling analysis in this study was conducted to map the current research fronts and thematic interconnections within the scholarly discourse on religious communication in the digital age. Following established scientometric protocols, the procedure began with the finalized corpus of 565 publications retrieved from Scopus. Unlike co-citation analysis which examines referenced documents, bibliographic coupling establishes relationships between the *source documents* themselves based on their shared references (Kessler, 1963). Specifically, a bibliographic coupling strength was calculated for each pair of publications within the corpus; this strength is defined as the number of references that two source documents have in common. The underlying premise is that publications sharing a significant number of references are likely to address similar research topics and build upon a common knowledge base, thereby forming a thematic group or "research front" (Vogel & Güttel, 2013). The resulting network of coupled documents was processed and visualized using VOSviewer software (van Eck & Waltman, 2010), which applies a clustering algorithm to group publications with the strongest bibliographic links.

The interpretation of the resulting clusters, such as Cluster 1 (Red) on "Converging Technologies" and Cluster 2 (Green) on "A Digital Framework for the Built Environment," involved analyzing the core publications within each group. The most central documents, indicated by high link strength and large node size, define the intellectual core of the cluster's theme. For instance, the strong coupling between Naeem et al. (2020) and Waleed et al. (2020) signifies a cohesive research front exploring AI and IoT convergence. Similarly, the link between Chang et al. (2018) and Chen et al. (2023) reveals an active scholarly conversation focused on digital frameworks for managing the built environment. This analytical procedure effectively shifts the focus from the historical intellectual foundations (revealed by co-citation) to the contemporary, active research fronts. It successfully delineates how distinct yet parallel research streams—from intelligent systems to digital heritage—are currently contributing to the broader landscape of digital religion, demonstrating the field's engagement with cutting-edge technological paradigms.

Cluster Coupling 1 (Red) ***Converging Technologies: The Application of Reinforcement Learning and IoT-Driven AI in Practical Domains***

Cluster 1 (Red) in the bibliographic coupling analysis identifies a prominent and active contemporary research front focused on the technological convergence of artificial intelligence (AI) within practical domains. This cluster maps the intellectual relationships between publications that collectively constitute a foundational body of literature concerning the application of Reinforcement Learning and Internet of Things (IoT)-driven AI. The work of Naeem et al. (2020) serves as the theoretical backbone of this cluster, providing a comprehensive introduction to the principles of reinforcement learning and its broad application potential across diverse fields. This theoretical foundation is subsequently operationalized within a specific context by Waleed et al. (2020), who demonstrate the integration of IoT and AI to solve precision-based challenges in agriculture, specifically in determining the precise work area for agricultural machinery.

Within the broader context of the bibliometric study on religious communication in the digital age, the emergence of this cluster is profoundly significant. Although the immediate application is within the agricultural sector, the core technologies discussed—autonomously learning AI systems (reinforcement learning) and networks of physical sensors (IoT)—carry profound implications for the future of digital religious practices. Scholars in digital religion likely reference the works within this cluster to conceptualize and develop adaptive, intelligent religious systems. Potential applications include the creation of intelligent AI assistants for personalized religious guidance (*digital da'wah*), the development of immersive virtual worship environments (metaverse) capable of adapting to congregational responses, or AI-optimized, IoT-based management systems for places of worship. Consequently, Cluster 1 signifies a pivotal juncture where the study of digital religion is beginning to engage deeply with the most advanced computational paradigms, thereby shifting the scholarly focus from mere online presence toward autonomous, learning-enabled, and adaptive religious ecosystems.

Cluster 2 (Green) ***A Digital Framework for the Built Environment: Leveraging BIM and IoT for Smart Facilities Management and Historical Preservation***

Cluster 2 (Green) in the bibliographic coupling analysis represents a significant research stream focused on the digital transformation of the built environment through advanced technologies. This cluster specifically maps the convergence of **Building Information Modeling (BIM)** and related digital frameworks for the dual purposes of smart facilities management and historical preservation. The work by Chang et al. (2018) serves as a cornerstone, presenting an automated BIM platform designed to enhance visualization and decision-making support for managing existing facilities, thereby optimizing their lifecycle. Complementing this, the research by Chen et al. (2023) demonstrates the application of digital documentation technologies for the critical task of architectural heritage conservation, specifically within the context of modern Chinese architecture, highlighting how digital tools can capture and preserve vital structural and historical information.

Within the overarching bibliometric analysis on religious communication in the digital age, the prominence of this cluster is highly relevant. It signifies scholarly recognition that the digital engagement with religion extends beyond virtual spaces to encompass the management, preservation, and digital twinning of physical religious structures. Researchers in this field likely draw upon the foundational work in this cluster to inform studies on the digital conservation of sacred sites, the use of BIM for managing complex religious facilities like mosques or cathedrals, and the creation of detailed virtual models for educational or preservation purposes. This technological foundation is crucial for projects that aim to create authentic and immersive digital replicas of historical religious buildings within metaverse environments, ensuring architectural and cultural accuracy. Thus,

Cluster 2 underscores a critical intersection where digital tools for the physical world directly enable and enhance the development of meaningful and authentic religious experiences in the digital realm.

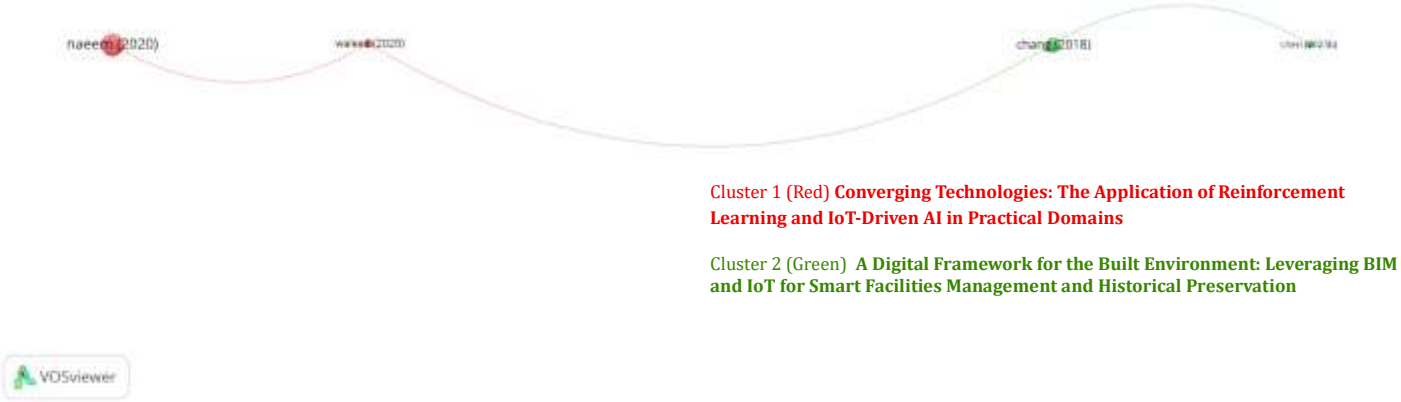

Figure 3. Network

Table 2

2 Top Primary Documents for Merging Bibliographic Clusters

Cluster Coupling	Author (Year)	Source	Secondary Document Description	Citation Strength
Cluster 1 (Red) **Converging Technologies: The Application of Reinforcement Learning and IoT-Driven AI in Practical Domains**	Naeem (2020)	Ieee access	A gentle introduction to reinforcement learning and its application in different fields	187
	Waleed (2020)	Applied sciences	Determining the precise work area of agriculture machinery using internet of things and artificial inteligence	29
Cluster 2 (Green) **A Digital Framework for the Built Environment: Leveraging BIM and IoT for Smart Facilities Management and Historical Preservation**	Chang (2018)	Applied sciences	An automated iot visualization bim platform for decision support in facilities management	92

	Chen (2023	sustainability	Digital documentation and conservation of architectural heritage information: an application in modern chinese architecture	20

Religious Communication in the Digital Age **:Future Research Agendas**

Table.3 Summary of Future Agenda

Context	Development
AI & IoT Integration	**Intelligent Religious Systems**: Create ethical frameworks for AI-driven religious applications (Quranic chatbots, automated fatwa systems). Explore IoT applications in sacred space management and ritual facilitation. New variables: *AI religious literacy score*, *ritual automation acceptance*, *sacred space IoT security protocols*.
Digital Preservation	**Heritage Documentation**: Develop standardized protocols for digital preservation of religious architectural heritage using BIM and 3D scanning. Create metadata schemas for religious cultural artifacts in metaverse environments. New variables: *digital preservation authenticity score*, *virtual pilgrimage accessibility index*, *cross-platform heritage interoperability*.
Methodological Innovation	**Bibliometric Expansion**: Future bibliometric studies should incorporate multi-language databases (including Arabic and Persian sources) and apply natural language processing to analyze religious semantic networks. New variables: *cross-linguistic citation patterns*, *religious concept diffusion metrics*, *theological discourse evolution indicators*.
Technological Foundations	**Augmented & Virtual Reality:** Future research should develop faith-specific AR/VR frameworks integrating real-time spatial computing (SLAM) with religious ritual requirements. New variables: *ritual fidelity index*, *immersion piety scale*, *haptic feedback compatibility*.
Human-Computer Interaction	**Religious Interface Ergonomics:** Establish religious UX principles based on Fitts' Law and cultural ergonomics. Investigate optimal interface designs for diverse user groups (elderly worshippers, digitally-native youth). New variables: *prayer gesture recognition accuracy*, *virtual prostration ergonomics*, *digital Quran readability metrics*.
Sociological Dynamics	**Digital Religious Capital:** Develop empirical measures for Bourdieusian capital in digital religious fields. Investigate how algorithmic visibility creates new religious authorities and marginalizes traditional structures. New variables: *algorithmic authority index*, *digital charisma metrics*, *online religious social capital*.

Conclusion

This bibliometric analysis has systematically mapped the intellectual structure and evolutionary trajectory of research on religious communication in the digital age, specifically tracing its development from traditional physical settings to emerging metaverse environments. The findings reveal a field in rapid transformation, characterized by exponential growth in scholarly output particularly after 2020, indicating a heightened academic response to the global digital acceleration during the pandemic period. The analysis demonstrates that research in this domain has evolved from initial explorations of social media's role in religious communication to more sophisticated engagements with immersive technologies and their sociological implications. This progression reflects the field's dynamic adaptation to technological advancements while maintaining its focus on understanding how digital environments reshape religious practice, authority, and community formation.

The co-citation analysis uncovered four foundational pillars supporting contemporary research in digital religious communication. The intellectual architecture reveals how augmented reality frameworks, human-computer interaction principles, Bourdieusian social theory, and spatial computing technologies collectively provide the theoretical and technological underpinnings for current investigations. The strong presence of Bourdieu's theories, particularly concepts of habitus, capital, and field, underscores the field's recognition that digital religious spaces are not technologically neutral but constitute new social fields where traditional power dynamics are both reproduced and transformed. This theoretical sophistication distinguishes the field from mere technological determinism, emphasizing instead the complex interplay between technology, society, and religious practice.

Complementing this intellectual foundation, the bibliographic coupling analysis identified two prominent research fronts representing the field's current trajectory. The convergence of reinforcement learning and IoT technologies points toward emerging interests in intelligent, adaptive religious systems capable of personalized spiritual guidance and automated ritual facilitation. Simultaneously, the focus on digital frameworks for the built environment, particularly through BIM and preservation technologies, highlights growing scholarly attention to the digital twin phenomenon in religious contexts—where physical sacred spaces are replicated and enhanced in digital environments. These research fronts demonstrate the field's expanding scope beyond communication studies to encompass computer science, architecture, and human-computer interaction.

The geographical and collaborative patterns revealed in this study present both opportunities and challenges for the field's development. The concentration of research productivity in specific countries, while ensuring depth in particular cultural contexts, also suggests the need for greater geographical diversity in future research. The emerging international collaborations, though still limited, indicate promising pathways for comparative studies across different religious and cultural traditions. Furthermore, the strong focus on open-access publications, while enhancing global accessibility, also raises questions about resource distribution and epistemic diversity in digital religion research, particularly regarding the inclusion of perspectives from the global South.

The findings carry significant implications for both theory and practice. Theoretically, this mapping exercise contributes to refining the conceptual framework for understanding digital religion by identifying the key variables and relationships that structure the field. The integration of technological theories with sociological frameworks provides a more holistic approach to analyzing digital religious phenomena. Practically, the identified research fronts offer valuable insights for religious practitioners, technology developers, and policymakers. Religious organizations can leverage these findings to develop more effective digital strategies, while technology designers can benefit from understanding the unique requirements of religious applications. For policymakers, this research highlights the need for regulatory frameworks that address emerging challenges in digital religious spaces, including issues of authenticity, authority, and accessibility.

This study concludes by outlining several promising research directions that emerge from the current mapping. Future investigations should develop faith-specific technological frameworks that account for the unique requirements of different religious traditions, particularly in immersive environments. There is an urgent need for cross-cultural comparative studies that examine how different religious communities adapt to and transform digital technologies. The ethical dimensions of AI and automation in religious practice require careful examination, as do the long-term effects of digital immersion on religious identity and community cohesion. Methodologically, future research would benefit from incorporating multi-lingual sources and developing more sophisticated analytical approaches that can capture the complex, multimodal

nature of digital religious communication. As the field continues to evolve, this bibliometric mapping provides a foundational reference point for navigating the complex terrain of religious communication from physical sanctuaries to digital metaverses, offering both a retrospective understanding of development and prospective guidance for future inquiry.

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