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MORALITY BEFORE KNOWLEDGE

Digital transformation of *takaful* through artificial intelligence: Trends in research and future directions

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ABSTRACT

Background: This study aims to map research trends concerning the integration of Artificial Intelligence (AI) in the development of Islamic insurance (takaful). **Methods:** Employing bibliometric techniques, the study analyzes data retrieved from the Scopus database for the period 2015–2025. **Findings:** The results indicate a significant increase in publications on AI and takaful, although overall output remains limited. The most productive contributors include Jan, S., Meskini, F.Z., and Mohamed, H., while the most frequently cited work is *Fintech and Islamic Finance: Digitalization, Development and Disruption* (2019) by Alam, Gupta, and Zameni, with 86 citations. *Lecture Notes in Networks and Systems* and *The Future of Islamic Finance: From Shari'ah Law to Fintech* are the leading publication outlets, whereas Stellar Consulting Group Ltd. records the highest institutional output. At the country level, Malaysia dominates the field with 12 publications, reflecting its strong research commitment. Thematic mapping highlights fintech, risk, company, contract, industry, design methodology approach, supervision, takaful company, and gap as central themes. Recent research emphasizes blockchain, financial inclusion, supervision, accuracy, and methodological design, while emerging but underexplored areas—such as the construction industry, government and state policy, permissioned blockchain, cooperation, and order—offer considerable potential for future inquiry. **Conclusion:** Research on AI in Islamic insurance is steadily expanding but remains in its formative stage. The field is highly interdisciplinary, with fintech and blockchain emerging as dominant themes, yet substantial opportunities remain for further exploration. **Novelty/Originality of this article:** This study provides the first systematic bibliometric mapping of AI in Islamic insurance, capturing publication trends, influential authors, institutions, and themes. By identifying both thematic evolution and research gaps, it offers state-of-the-art insights and new directions for advancing Shari'ah-compliant digital finance in an inclusive and sustainable manner. Future research should focus on developing integrative AI-based takaful models that enhance ethical governance, financial inclusion, and regulatory alignment to ensure sustainable growth of the Shari'ah-compliant digital finance ecosystem.

KEYWORDS: artificial intelligence; bibliometric; digitalization; islamic fintech; takaful.

1. Introduction

Artificial Intelligence (AI) has emerged as one of the most transformative technologies of recent decades, reshaping the ways in which industries operate and innovate (Pattnaik et al., 2024; Thomas, 2024). AI refers to computer systems capable of performing tasks that typically require human intelligence, such as learning, reasoning, decision-making, and pattern recognition (Janiesch et al., 2021; Okonkwo & Ade-Ibijola, 2021; Sethy et al., 2023). Within the financial sector, AI has played a pivotal role in enhancing efficiency, accuracy, and the personalization of services (Sarea et al., 2021; Tarmom et al., 2022). The insurance industry—including Islamic insurance—has been no exception to this transformation.

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In the context of takaful, the application of AI has become increasingly relevant in ensuring compliance with Islamic principles, particularly the prohibition of *riba* (usury), *gharar* (excessive uncertainty), and *maisir* (gambling) (Sundari et al., 2024; Yahya et al., 2024b). AI offers significant potential for improving operational efficiency, transparency, and adherence to *Shari'ah* governance (Marpaung & Aslami, 2025). Among the most affected processes is underwriting—the assessment of participants' risk profiles. While traditionally manual and time-consuming, underwriting becomes markedly more efficient and accurate with AI (Jaiswal, 2023; Kumar, 2024). In takaful, AI facilitates more equitable, data-driven risk profiling, enabling contributions to be adjusted in line with participant risk without compromising the cooperative nature of takaful, while simultaneously reducing *gharar*, which has long been a structural challenge (Arsyad et al., 2025; Khoso & Pathan, 2025).

Beyond underwriting, AI has also transformed the claims process, historically characterized by bureaucracy, delays, and susceptibility to fraud (Alam & Prybutok, 2024). Through automation, image recognition, Natural Language Processing (NLP), machine learning, and increasingly with blockchain and smart contracts, claims can now be processed faster, more transparently, and more equitably. These innovations reduce disputes between participants and providers, ensure that *tabarru'* funds are utilized in accordance with contractual agreements, and prevent excessive *gharar* (Ibrahim et al., 2024; Johnson et al., 2023; Rafaheh, 2024). Equally important, AI is redefining customer engagement. Chatbots and virtual assistants provide responsive customer service while serving as platforms for participant education on takaful principles, product benefits, and *Shari'ah* compliance. Supported by NLP, these tools deliver automated consultation, accelerate response times, and enhance user experience, while reducing the workload of customer service personnel (Rabbani et al., 2021; Sarea et al., 2021; Yahya et al., 2024a).

Despite these advances, the adoption of AI in takaful faces notable challenges. Chief among these is ensuring that AI algorithms strictly align with *Shari'ah* principles (Salma et al., 2023). Underwriting, claims processing, and risk assessment in AI-driven systems are heavily dependent on the quality of data and the design of machine learning models. A further challenge is building public trust in AI systems for Islamic insurance management, as participants may feel uneasy about automated decision-making in sensitive areas such as claims and underwriting (Cahyandari et al., 2023; Rahmadhani et al., 2024). Transparency is therefore essential in order to demonstrate how AI decisions are generated and how fairness and *Shari'ah* compliance are maintained. Additionally, technological infrastructure constraints remain a barrier, as not all takaful operators possess access to advanced AI technologies or the skilled human resources required to manage them effectively (Ashraf, 2023). Investment in infrastructure development and capacity building will therefore be critical to the successful implementation of AI in the takaful industry.

Although AI has significantly transformed the conventional insurance industry, its application within Islamic insurance (takaful) remains relatively nascent and underexplored in academic scholarship (Htay et al., 2015). Most existing studies primarily address the use of AI in insurance in general, without adequately accounting for the distinctive dimensions that differentiate Islamic insurance from its conventional counterpart—namely, the principles of justice, transparency, and the avoidance of *gharar* (excessive uncertainty), *riba* (usury), and *maisir* (gambling). This gap highlights the need for more in-depth studies examining how AI is applied within the takaful ecosystem.

A fundamental question that arises in this context is how research trends on AI in Islamic insurance have evolved over the past two decades. With the rapid digitalization of the Islamic finance sector, understanding the trajectory and thematic direction of AI-related scholarship in takaful has become increasingly important. Are studies in this field still largely exploratory, or have they progressed toward more systematic applications? Do certain approaches dominate the literature, such as those focusing on underwriting, claims management, risk assessment, or customer service? Addressing these questions is critical for offering a comprehensive view of the extent to which AI adoption in takaful has been understood within both academic and industry domains.

The urgency of this inquiry is underscored by the paucity of studies specifically examining the implementation of AI in Islamic insurance through bibliometric approaches. Bibliometric analysis provides a systematic means of mapping research trends, identifying the journals, authors, and key themes that have shaped scholarly discourse in recent years. Such evidence-based mapping is essential for stakeholders—including regulators, academics, and industry practitioners—who require structured guidance to design AI adoption strategies that are not only innovative but also consistent with *Shari'ah* principles. Accordingly, this study seeks to analyze the development of research on AI applications in Islamic insurance using bibliometric methods. Through this analysis, the study identifies the growth of publications, the institutions and authors contributing most significantly to the field, and the evolution of themes related to AI in takaful over the past two decades, thereby offering a comprehensive overview of the intellectual landscape in this domain.

The novelty of this research lies in its systematic bibliometric mapping of scholarly output on AI in Islamic insurance over recent years. This approach not only reveals publication trends, influential authors, institutions, and contributing countries but also captures the evolution of research themes, core topics, and underexplored areas. In doing so, it presents a state-of-the-art review of AI in takaful that has not previously been mapped in the literature, particularly regarding the position of Islamic insurance within the broader context of global digital transformation. Beyond this, the study contributes by identifying knowledge gaps and offering new research directions that may accelerate the integration of AI into the Islamic finance ecosystem in an inclusive, sustainable, and *Shari'ah*-compliant manner.

This research is expected to provide multidimensional benefits across academic, practical, and social domains. From an academic perspective, it enriches the still-limited literature on AI integration in takaful through a bibliometric lens, while identifying trends, challenges, opportunities, and emerging themes. From a practical standpoint, its findings serve as valuable references for industry practitioners and regulators in formulating AI adoption strategies aligned with *Shari'ah* principles and adaptive policy responses to digital innovation. From a social dimension, this research promotes technological literacy in Islamic finance and broadens financial inclusion, positioning takaful as a strategic instrument for social transformation toward an innovative, inclusive, and sustainable future.

2. Methods

2.1 Research design and approach

This study employs a bibliometric approach to identify trends in research on Artificial Intelligence (AI) and the Islamic insurance (takaful) sector. By utilizing bibliometric analysis, relevant publications were examined to uncover research patterns, key concepts, and significant keywords (Ferrer-Serrano et al., 2025; Van-Eck & Waltman, 2010, 2022; Van Eck et al., 2010). Bibliometric mapping was used as a tool to gain deeper insights into the thematic structure of the field (Borgman & Furner, 2002).

2.2 Data collection and analysis procedures

The data were retrieved from Scopus, one of the world's largest indexing platforms, which covers the majority of international journals and provides access to bibliographic information including titles, abstracts, and keywords (Chadegani et al., 2013; Falagas et al., 2008). The data collection process involved the following steps: 1) Keyword Selection. Relevant keywords were identified to capture publications related to the topic, such as *artificial intelligence, big data analytic, blockchain, smart contract, machine learning, deep learning, Islamic insurance, Sharia insurance*, and *takaful*.

A comprehensive query string was employed to maximize coverage: (TITLE-ABS-KEY (artificial AND intelligence) OR TITLE-ABS-KEY (ai) OR TITLE-ABS-KEY

(big AND data AND analytic) OR TITLE-ABS-KEY (blockchain) OR TITLE-ABS-KEY (smart AND contract) OR TITLE-ABS-KEY (machine AND learning) OR TITLE-ABS-KEY (deep AND learning) AND TITLE-ABS-KEY (islamic AND insurance) OR TITLE-ABS-KEY (sharia AND insurance) OR TITLE-ABS-KEY (takaful)). 2) Database Selection. The study focused exclusively on Scopus-indexed journals, ensuring broad coverage of high-quality international publications. 3) Inclusion and Exclusion Criteria. Only publications appearing in peer-reviewed international journals indexed in Scopus between 2015 and 2025 were considered. Editorials, notes, and non–peer-reviewed materials were excluded from the analysis. 4) Data Cleaning. The retrieved dataset was subjected to a rigorous verification process to ensure accuracy and consistency. This included the removal of duplicates, validation of metadata (titles, authors, institutions, and abstracts), and coding of the core themes of each publication.

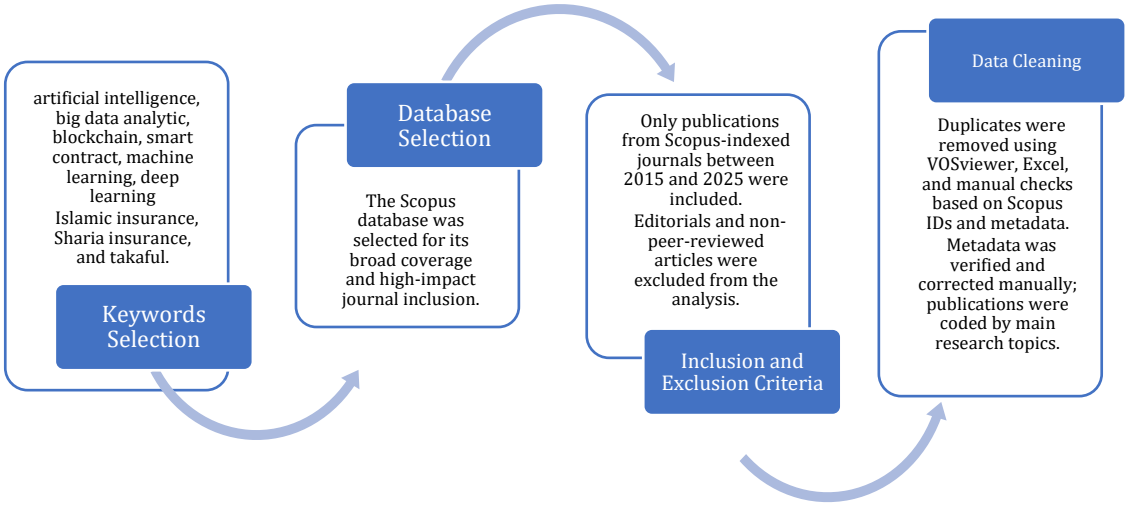

Fig 1. The Data Collection Process

Following data collection, bibliometric analysis was conducted using VOSviewer, a widely recognized software for visualizing bibliometric networks. The analysis consisted of: 1) Publication Analysis – identifying the annual number of publications to track research trends over time, 2) Author Analysis – determining the most productive and influential authors in the field of AI applications in Islamic insurance, 3) Institutional and Country Analysis – mapping the institutions, affiliations, and countries contributing most significantly to the research landscape 4) Keyword and Thematic Analysis – identifying frequently occurring keywords and core themes to capture the focus and emerging directions of research.

The results of the bibliometric analysis were presented through graphs, tables, and network maps to facilitate interpretation. These visualizations helped illustrate relationships and patterns within the data and identify areas requiring further scholarly attention. To enhance the reliability of the findings, results were triangulated with complementary sources, including expert interviews, practitioner insights, and additional relevant literature (Van-Eck & Waltman, 2022).

3. Results and Discussion

3.1 Publication Development

Following the extraction and mapping of scientific publications related to Artificial Intelligence (AI) and Islamic insurance from the Scopus database, the distribution of publication growth is illustrated in Figure 2.

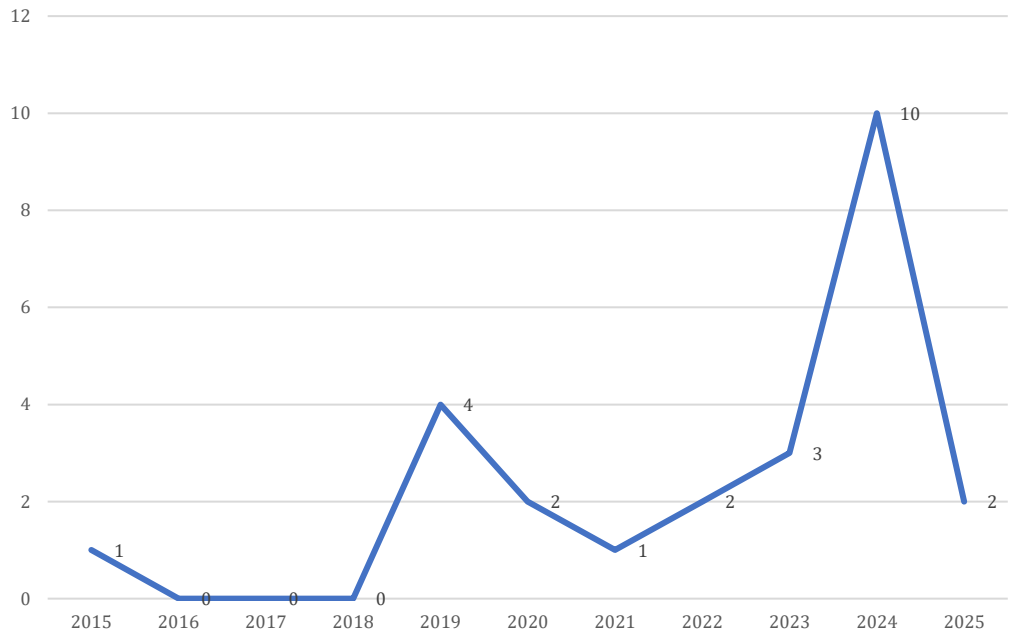

Fig. 2. Growth of Publications on AI and Islamic Insurance
Source: Scopus.com (Processed Data, 2025)

Figure 2 presents the annual distribution of publications on AI and Islamic insurance indexed in Scopus between 2015 and 2025. The data reveal a research trend that, while still relatively limited in scope, demonstrates a notable increase in recent years. In 2015, only a single publication addressed AI in the context of Islamic insurance, reflecting the minimal academic attention devoted to this topic during that period. After a short hiatus, the number of publications rose to four in 2019, marking an initial wave of scholarly interest in exploring AI's role within Islamic finance, including insurance. However, the subsequent years showed fluctuations, with only two publications in 2020 and one in 2021, suggesting that despite emerging interest, research growth had yet to reach a stable trajectory.

In 2022, publications increased modestly to two, followed by three in 2023. A significant surge occurred in 2024, when the number of publications rose sharply to ten—representing 40% of the total output within the observed timeframe. This spike reflects heightened academic interest in AI applications in Islamic insurance, likely aligned with technological advancements, regulatory developments, and broader AI adoption across the Islamic finance industry. In 2025, the number of publications declined to two, though this still signals a sustained continuity of research within the field.

These dynamics highlight a growing awareness of the importance of scholarly inquiry into AI within Islamic insurance, from the perspectives of technology, regulation, and *Shari'ah* compliance. The increase in publications may also indicate the expansion of research initiatives driven by both AI innovations and the challenges associated with their integration into the Islamic finance ecosystem. Collectively, the data provide valuable insights into the evolution of research in this domain and form a foundation for further analysis of the drivers and constraints shaping AI scholarship in takaful.

Table 1 illustrates the distribution of publication types addressing AI applications in Islamic insurance, based on Scopus data as of 2025. A total of 25 documents were analyzed, representing diverse forms of academic output. The majority of publications were journal articles (10 documents, 40%), underscoring that research on AI in Islamic insurance is primarily disseminated through peer-reviewed journals, which provide high academic credibility and contribute significantly to the development of the literature in this area.

Table 1. Types of Publications on AI in Islamic Insurance

Document Type	Number	Percentage
Article	10	40
Conference Review	7	28
Conference Paper	4	16
Book Chapter	2	8
Book	1	4
Review	1	4
Total	25	100.00

Conference reviews ranked second with seven documents (28%), followed by conference papers with four documents (16%). The relatively large proportion of conference-related publications suggests that research in this field is still in an exploratory phase and often discussed in academic forums such as seminars and symposia. Such outputs frequently represent emerging trends that later develop into full journal publications. Book chapters accounted for two documents (8%), indicating that this topic is beginning to gain attention in broader academic volumes, such as edited collections. In addition, one book (4%) was identified, likely offering a more comprehensive treatment of AI in Islamic insurance. Similarly, one review article (4%) reflects efforts to synthesize and evaluate prior findings, providing broader insights into the field. This distribution of publication types suggests that while research on AI in Islamic insurance remains at an early stage of development, academic attention to the topic is steadily increasing. Journal articles remain the dominant dissemination channel, while conference papers continue to play an important role in presenting innovations and emerging discussions. The diversity of document types further indicates that AI in Islamic insurance is gaining a foothold within academic discourse and holds strong potential for further scholarly expansion in the coming years.

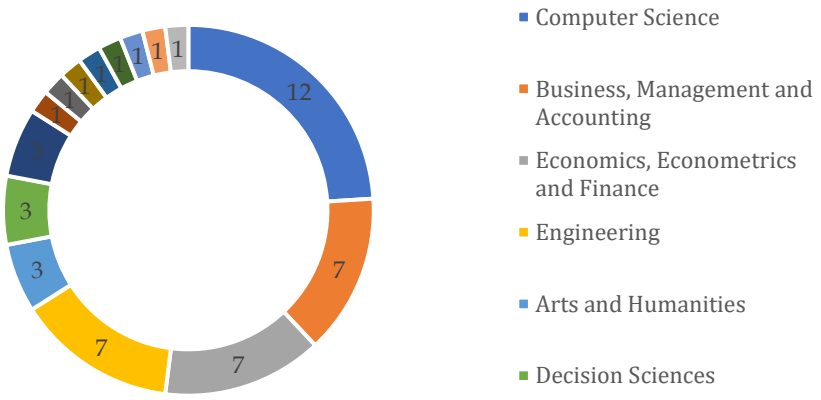

Fig 3. Subject Area of Publications

Figure 3 illustrates the distribution of research domains addressing Artificial Intelligence (AI) in Islamic insurance (takaful), based on data retrieved from Scopus up to 2025. The analysis reveals that *Computer Science* accounts for the largest share with 12 publications. This indicates that technology-driven approaches—such as machine learning, big data analytics, and AI-based systems—play a central role in driving innovation within the Islamic insurance industry.

In addition, the fields of *Business, Management and Accounting*, *Economics, Econometrics and Finance*, and *Engineering* each contributed seven publications. This underscores the growing academic interest in exploring the business and economic

dimensions of AI implementation in Islamic insurance, particularly in optimizing risk management, enhancing operational efficiency, and ensuring compliance with Sharīʿah principles. The contribution of *Engineering* reflects the role of technological infrastructure and automation systems in supporting the operational backbone of the industry. Meanwhile, *Arts and Humanities*, *Decision Sciences*, and *Social Sciences* each recorded three publications, suggesting an increasing focus on the ethical, regulatory, and societal implications of AI adoption in Islamic insurance. The emergence of *Decision Sciences* also highlights scholarly efforts to examine AI-driven decision-making processes, particularly their potential to strengthen transparency and efficiency in Sharīʿah-compliant insurance services.

Several other disciplines—such as *Agricultural and Biological Sciences*, *Biochemistry, Genetics and Molecular Biology*, *Environmental Science*, *Immunology and Microbiology*, *Materials Science*, *Mathematics*, *Medicine*, and *Pharmacology, Toxicology and Pharmaceutics*—each contributed a single publication. Although limited in number, these contributions reflect a multidisciplinary perspective, particularly regarding the use of AI for managing health risks, environmental uncertainties, and biological considerations relevant to Islamic life and health insurance.

Overall, the distribution demonstrates that research on AI in Islamic insurance has expanded across multiple disciplines, with technology, economics, and management emerging as the most dominant domains. This trend reinforces the notion that implementing AI in Islamic finance necessitates a cross-disciplinary approach to adequately address the opportunities and challenges associated with advanced technologies in this sector.

3.2 Authors and citations

From the perspective of authorship, several researchers have made comparatively more contributions than others.

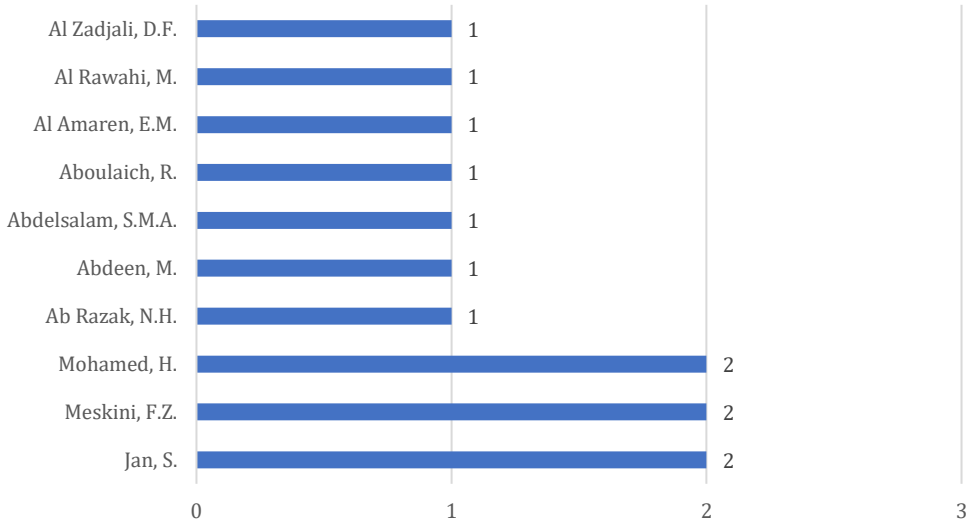

Fig 4. Number of Publications by Author (Top 10)
Source: Scopus.com (Processed Data, 2025)

Figure 4 presents the ten most prolific authors publishing on AI and Islamic insurance based on Scopus data up to 2025. The results indicate that research output on this subject remains highly fragmented, with most authors contributing only one or two publications. The most productive contributors include *Jan, S.*, *Meskini, F.Z.*, and *Mohamed, H.*, each with two publications. Their work reflects active engagement with the topic, although the overall volume of output remains limited compared to more established fields. The remaining seven authors—*Ab Razak, N.H.*, *Abdeen, M.*, *Abdelsalam, S.M.A.*, *Aboulaich, R.*, *Al Amaren, E.M.*,

Al Rawahi, M., and *Al Zadjali, D.F.*—have each published a single work on AI in Islamic insurance. Their presence in the top ten list underscores the emerging and exploratory nature of the field, as it has not yet been shaped by a concentrated group of leading scholars.

This suggests that research on AI in Islamic insurance is still in its formative stages and lacks prominent key figures with substantial publication records. Consequently, further research and scholarly collaboration are essential to broaden and deepen the field. Future analysis could also explore collaboration patterns among these authors and assess the extent of their collective contribution to shaping the academic discourse. As scholarly and industry interest in AI within Islamic finance continues to grow, the number of publications and academic engagement in this field is expected to rise accordingly. Table 2 presents the ten most-cited articles in this field, with a primary focus on blockchain technology, Islamic insurance (takaful), and digitalization. The high citation counts of these works underscore both their academic significance and their practical impact on the Islamic finance industry.

The most highly cited article is *"Fintech and Islamic Finance: Digitalization, Development and Disruption"* by Alam, Gupta, and Zameni (2019), which has received 86 citations. This work has become a cornerstone reference for scholars and practitioners seeking to understand how digitalization is reshaping the landscape of Islamic finance. The study explores various aspects of financial technology (fintech), including innovations in digital payments, smart contracts, and the disruptive impact of emerging technologies on Sharīʿah-compliant financial systems. Its substantial citation count reflects the centrality of this discourse in shaping debates about the future of Islamic finance in the digital era.

Ranked second is *"A Novel Blockchain-Based Framework for Vehicle Life Cycle Tracking: An End-to-End Solution"* by Syed et al. (2020), with 35 citations. This study examines the application of blockchain technology in vehicle life cycle tracking, highlighting its potential to enhance transparency and efficiency within Islamic FinTech ecosystems. Although blockchain is most commonly associated with financial transactions and cryptocurrencies, this research demonstrates its broader utility in industries such as automotive finance, particularly in vehicle ownership and Sharīʿah-compliant financing systems. The third-ranked article, *"Business Trends & Challenges in Islamic FinTech: A Systematic Literature Review"* by Dawood et al. (2022), has received 14 citations. By providing a systematic review of business trends and challenges in Islamic FinTech, the paper offers essential insights for researchers and practitioners. It highlights regulatory complexities, technological infrastructure requirements, and consumer behavior as critical factors shaping the evolution of Islamic finance in the digital era.

Several other studies focusing on blockchain applications in takaful have also gained attention, including *"Multi-agent Based Simulation of a Smart Insurance Using Blockchain Technology"* (Meskini & Islamic, 2019) and *"Employing Takaful Islamic Banking through State of the Art Blockchain: A Case Study"* (Abdeen et al., 2019), each with seven citations. These works illustrate how blockchain can improve efficiency and transparency in Islamic insurance systems, particularly in claims processing, contract execution, and risk management. The integration of smart contracts into takaful is highlighted as a significant innovation with the potential to build consumer trust and reduce fraud in Sharīʿah-compliant insurance services.

The citation patterns in Table 2 reflect growing academic attention to digitalization in Islamic finance, with particular emphasis on blockchain, artificial intelligence, and data analytics across domains such as Islamic insurance and digital financial systems. The high citation impact of selected articles highlights the relevance of these topics for both research development and industry practice. Furthermore, the data suggests considerable opportunities for future research in Islamic digital finance, especially concerning regulatory frameworks, cybersecurity, and the adoption of advanced technologies by Islamic financial institutions.

Table 2. Top 10 Most-Cited Publications

Rank	Author	Title of article	Year	Publication outlet	Number of citations
1	Alam N.; Gupta L.; Zameni A.	Fintech and Islamic finance: Digitalization, development and disruption	2019	Fintech and Islamic Finance: Digitalization, Development and Disruption	86
2	Syed T.A.; Siddique M.S.; Nadeem A.; Alzahrani A.; Jan S.; Khattak M.A.K.	A Novel Blockchain-Based Framework for Vehicle Life Cycle Tracking: An End-to-End Solution	2020	IEEE Access	35
3	Dawood H.; Al Zadjali D.F.; Al Rawahi M.; Karim D.S.; Hazik D.M.	Business trends & challenges in Islamic FinTech: A systematic literature review	2022	F1000Research	14
4	Meskini F.Z.; Islamic R.A.	Multi-agent based simulation of a smart insurance using Blockchain technology	2019	2019 3rd International Conference on Intelligent Computing in Data Sciences, ICDS 2019	7
5	Abdeen M.; Jan S.; Khan S.; Ali T.	Employing Takaful islamic banking through state of the art blockchain: A case study	2019	International Journal of Advanced Computer Science and Applications	7
6	Ataabadi P.E.; Neysiani B.S.; Nogorani M.Z.; Mehraby N.	Semi-Supervised Medical Insurance Fraud Detection by Predicting Indirect Reductions Rate using Machine Learning Generalization Capability	2022	2022 8th International Conference on Web Research, ICWR 2022	5
7	Al Amaren E.M.; Al-Husban M.M.	A Critical Overview of Islamic Performance Bonds	2024	Legality: Jurnal Ilmiah Hukum	4
8	Meskini F.Z.; Aboulaich R.	A New Cooperative Insurance Based on Blockchain Technology: Six Simulations to Evaluate the Model.	2020	2020 International Conference on Intelligent Systems and Computer Vision, ISCV 2020	3
9	Mohamed H.	Takaful (Islamic insurance) on the blockchain	2019	The Growth of Islamic Finance and Banking: Innovation, Governance and Risk Mitigation	2
10	Kusmayadi D.; Firmansyah I.; Hermansyah I.	Islamic Insurance on Research: Bibliometric Analysis	2021	Library Philosophy and Practice	2

3.3 Publication outlets, affiliations, and countries

An analysis of the 25 publications retrieved from Scopus reveals the top ten publication outlets, as presented in Figure 5.

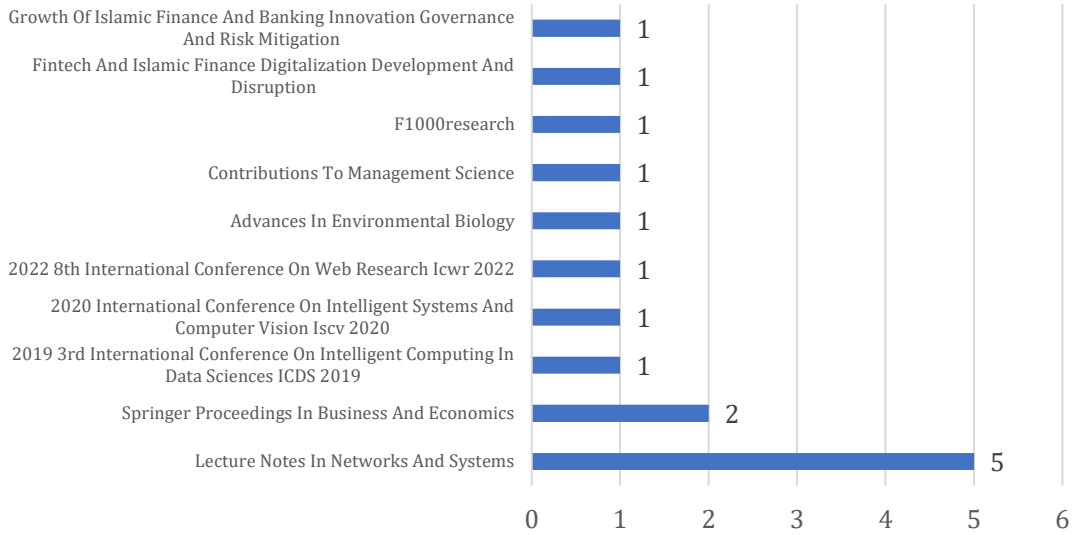

Fig. 5. Top 10 Publication Outlets and Number of Publications

Figure 5 illustrates the distribution of publication outlets hosting research on Islamic finance, digital technologies, and innovation in the Sharīʿah-compliant financial industry. Each outlet plays a distinct role in disseminating knowledge, with variation in publication counts reflecting their respective emphasis on Islamic finance and digitalization.

The outlet with the highest number of publications is *Lecture Notes in Networks and Systems*, with five entries. This indicates that conferences and journals under this series serve as major platforms for disseminating research on Islamic financial technologies and digitalization in Sharīʿah-compliant economic systems. Ranked second is *Springer Proceedings in Business and Economics*, with two publications. As part of Springer's renowned business and economics platform, this outlet makes a substantial contribution to the academic discussion on the growth of Islamic finance and the challenges and opportunities emerging from fintech advancements.

Other outlets, such as the *2019 3rd International Conference on Intelligent Computing in Data Sciences (ICDS 2019)*, the *2020 International Conference on Intelligent Systems and Computer Vision (ISCV 2020)*, and the *2022 8th International Conference on Web Research (ICWR 2022)*, each contributed one publication. Their inclusion highlights that issues of digitalization in Islamic finance have also been addressed in international conferences focused on artificial intelligence, big data, and intelligent computing systems. Beyond conferences, several journals and academic book series also appear in the list, such as *Advances in Environmental Biology*, *Contributions to Management Science*, and *F1000Research*, each with one publication. These examples demonstrate that research on Islamic finance and digitalization extends beyond economics and business, intersecting with disciplines such as management, environmental studies, and applied technologies.

The diversity of outlets indicates that scholarship on Islamic finance and digital transformation has been disseminated through a wide range of academic platforms, including conference proceedings, peer-reviewed journals, and scholarly book series. This breadth underscores both the interdisciplinary nature of the field and the importance of multiple publication channels in facilitating global academic exchange and collaboration. Looking ahead, this trend is likely to accelerate in tandem with the expanding role of technology in shaping the future of the Islamic financial industry.

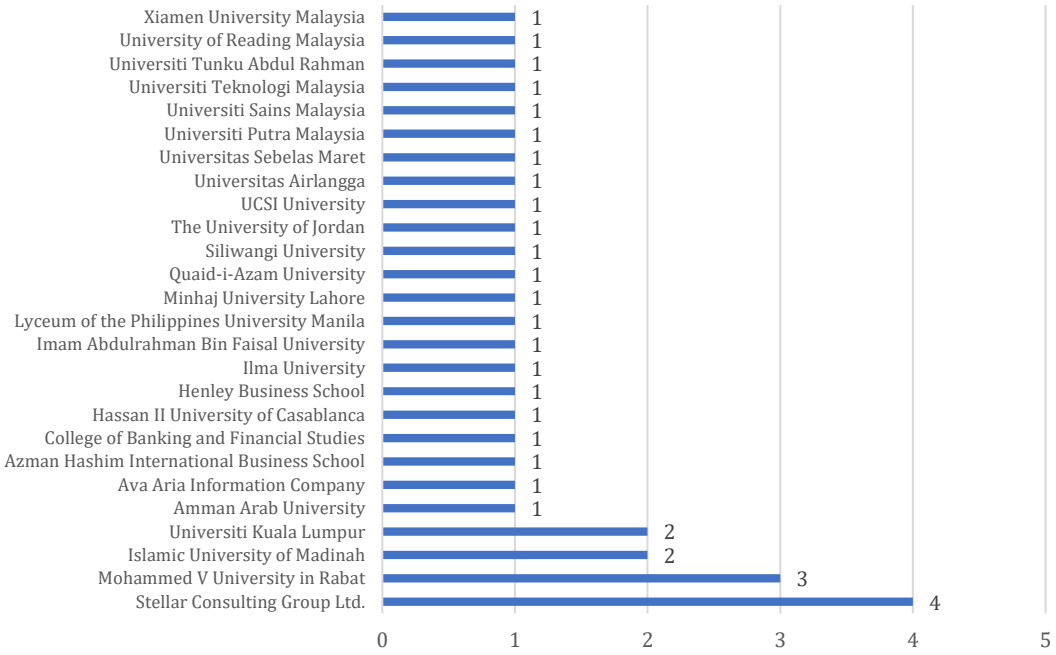

Fig. 6. Number of Publications by Institution/Affiliation

Figure 6 illustrates the distribution of publications by institution or affiliation actively engaged in research on Artificial Intelligence (AI) and Islamic insurance (takaful). The data, processed from Scopus in 2025, highlights the institutions contributing to the development of technology-driven Islamic finance and the application of AI within the Islamic insurance industry. The leading contributor is Stellar Consulting Group Ltd., with four publications, reflecting the institution's strong research focus on AI and Islamic insurance—likely in the areas of AI-based risk analysis and operational efficiency in Sharia-compliant financial systems. In second place, Mohammed V University in Rabat recorded three publications, underscoring its well-established academic tradition in Islamic finance and its active engagement in integrating digital technologies with Sharia principles. Other institutions, including the Islamic University of Madinah and Universiti Kuala Lumpur, each contributed two publications, indicating a growing interest among Islamic higher education institutions in exploring AI applications within Sharia finance and FinTech.

Additionally, several institutions produced one publication each, such as Amman Arab University, Universitas Airlangga, Universitas Sebelas Maret, Universiti Teknologi Malaysia, University of Reading Malaysia, and Hassan II University of Casablanca. This diversity demonstrates that research on AI and Islamic insurance has gained traction across multiple regions, including the Middle East, Southeast Asia, and North Africa. Notably, prominent Malaysian universities such as Universiti Putra Malaysia, Universiti Sains Malaysia, and Xiamen University Malaysia also appear among the contributors, signaling Malaysia's role as a key research hub in AI and Islamic finance. This trend aligns with the country's policy agenda, which consistently promotes innovation in the Islamic financial sector through the adoption of digital technologies.

Overall, the data reveal that research in this field is not limited to academic environments but also attracts interest from industry and consulting institutions. As scholarship in this area continues to grow, greater collaboration among universities, industry actors, and Islamic financial institutions is anticipated to accelerate the effective integration of AI into Sharia-compliant insurance systems.

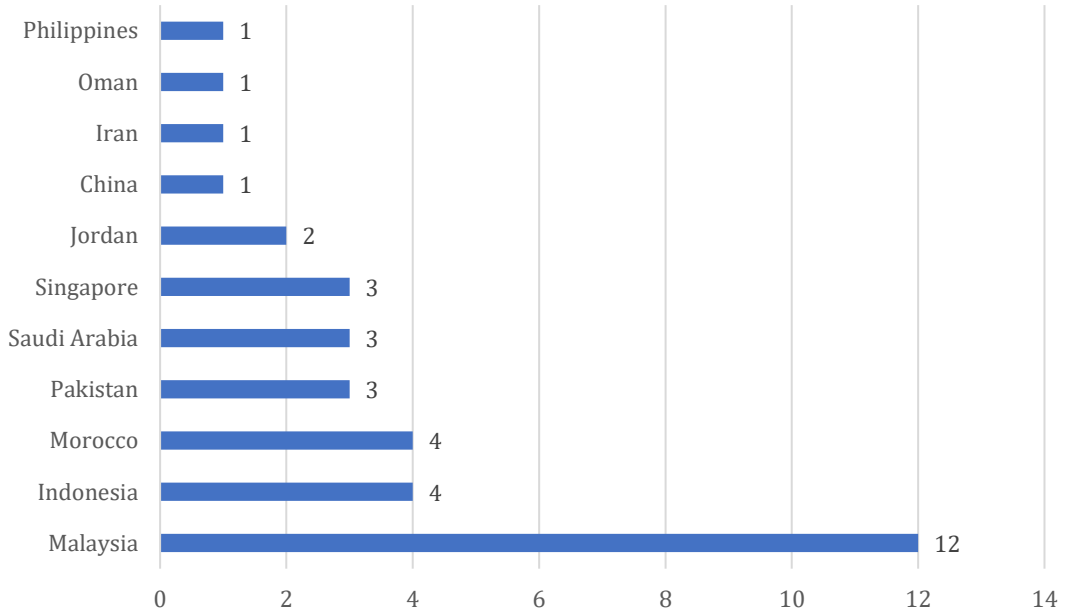

Fig. 7. Number of Publications by Country

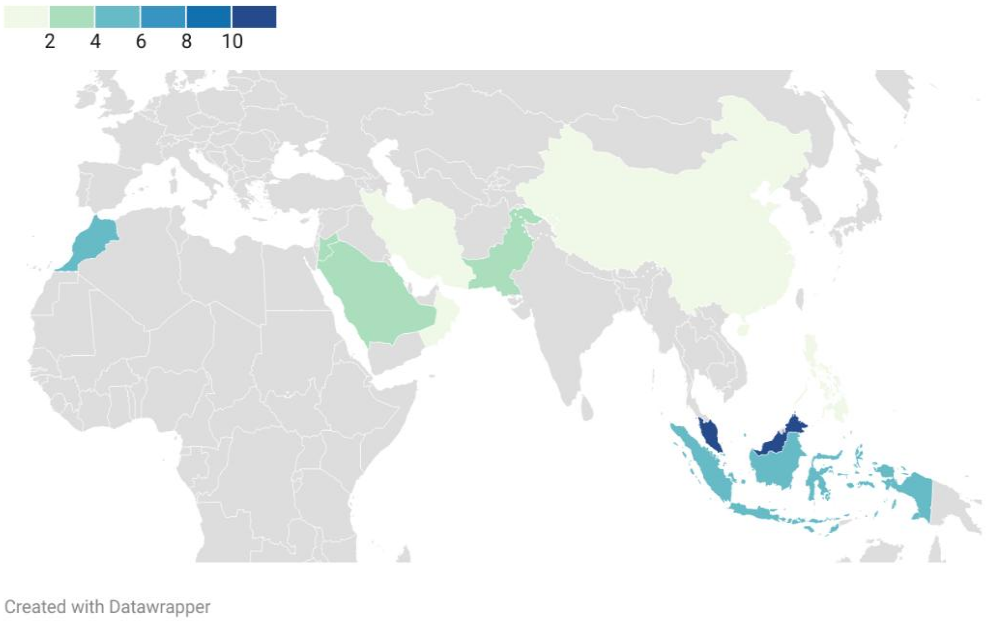

Fig. 8. Geographical Distribution of Publications by Country

From the perspective of author affiliation, Figure 7 and 8 present the global distribution of scholarly contributions on this topic. Malaysia leads with 12 publications, highlighting its dominance and strong commitment to positioning AI and Islamic insurance as a national research priority. This emphasis reflects Malaysia's broader strategy to integrate modern technology with Islamic values through research policies, the development of the halal industry, and long-standing initiatives under the "Islamic Digital Economy" framework. Institutional support from leading universities, including the International Islamic University Malaysia (IIUM) and University of Malaya, along with collaborations with Islamic financial institutions, further consolidates Malaysia's position as a regional—and arguably global—center of excellence in this domain.

Indonesia and Morocco follow in second place with four publications each. Despite lower output compared to Malaysia, their contributions remain significant. Indonesia, as the

world's most populous Muslim-majority country, has considerable potential in advancing research on Islamic finance, including takaful. A growing number of Indonesian universities, both public and private, have begun to focus on integrative studies that combine digital technologies with Sharia principles. However, a key challenge lies in maintaining consistency in producing high-quality, globally indexed publications. Morocco, meanwhile, demonstrates strong academic potential within North Africa, a region historically renowned for its Islamic scholarly tradition. Its involvement in digital transformation and Islamic finance discourse positions its publications as important contributions from the region.

Pakistan, Saudi Arabia, and Singapore each contributed three publications, ranking third. These countries represent diverse contexts. Pakistan is marked by vibrant academic activity and rapid growth in Sharia-compliant fintech. Saudi Arabia, as the spiritual center of the Muslim world, has a strategic interest in aligning modern Islamic finance systems with its Vision 2030. Singapore, though a secular state, possesses a highly advanced and inclusive financial system, enabling interdisciplinary research that merges cutting-edge technologies with the needs of Muslim markets.

Jordan contributed two publications, reflecting the Middle East's engagement in Islamic finance scholarship, particularly through higher education institutions oriented toward Sharia-compliant finance. Meanwhile, China, Iran, Oman, and the Philippines each recorded one publication. Although smaller in number, their contributions remain noteworthy, underscoring the breadth of academic interest in integrating AI with Islamic insurance principles. For instance, China is increasingly pursuing cross-cultural collaborations in Islamic finance, while Iran, with its robust Islamic scholarly tradition, offers perspectives rooted in Shi'a-oriented approaches.

These findings suggest that while Malaysia clearly dominates the field, research activity is also emerging across geographically, socially, and culturally diverse regions. This diversity indicates that the study of AI and Islamic insurance is inherently global, inclusive, and relevant across national boundaries. The breadth of contributions further points to the significant potential for international collaboration—among scholars, research institutions, and industry stakeholders—to strengthen the role of AI-driven Islamic insurance within the broader context of global digital transformation. In short, these trends mark an important step toward building a more mature research and policy ecosystem that integrates Islamic values with contemporary technological innovation.

3.4 Mapping the development of research on artificial intelligence and Islamic finance

The mapping of research developments on artificial intelligence (AI) and Islamic finance using VOSviewer produced a visualization that illustrates the interconnections among frequently occurring topics in the literature. For the type of data, the option *create a map based on text data* was selected. In the *data source* menu, the feature *read data from reference manager files* with the supported file type RIS was employed. The *counting method* applied was Full Counting, with a minimum occurrence threshold of two terms. Based on these criteria, 155 terms from 25 documents were selected for analysis. The resulting thematic mapping of AI and Islamic finance, generated through the *network visualization mode*, is presented in Figure 2.

Figure 10 displays the bibliometric mapping of research on AI and Islamic insurance, consisting of several distinct clusters formed through the co-occurrence of keywords. In this visualization, each node represents a frequently appearing keyword in the literature, while the links connecting nodes reflect thematic relationships between keywords. The size of the node indicates the frequency of a keyword's occurrence in the analyzed publications—the larger the node, the more frequently the topic appears. Likewise, thicker links signify stronger relationships, suggesting that the keywords often co-occur in the same studies.

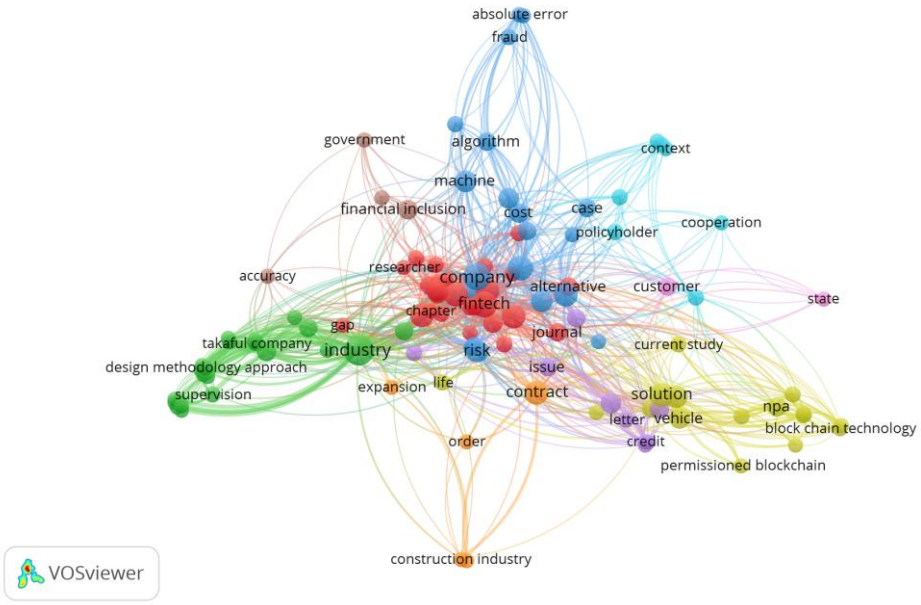

Fig. 9. Mapping of Artificial Intelligence and Islamic Insurance Research Topics (Network Visualization Mode)

Based on the bibliometric mapping, five major thematic clusters were identified, each representing a distinct area of discussion within the intersection of Artificial Intelligence (AI) and Islamic insurance (takaful). The first cluster, represented in red, centers on Islamic finance and fintech research. This cluster includes keywords such as fintech, risk, company, and contract, indicating that many studies focus on risk management practices within Islamic financial systems and their integration with financial technology. The appearance of terms such as journal and chapter further suggests the existence of an expanding academic discourse concerning regulatory and contractual dimensions of technology-driven Islamic insurance.

The second cluster, shown in green, emphasizes methodologies and research approaches in takaful studies. Keywords including industry, design methodology approach, supervision, takaful company, and gap demonstrate that scholars continue to explore and refine methodological frameworks aimed at improving Sharia-compliant insurance systems. This cluster also reflects the growing concern regarding governance, supervision, and research gaps within the takaful industry.

The third cluster, represented in blue, relates to Artificial Intelligence and financial risk management. Dominant keywords such as machine, algorithm, cost, fraud, and absolute error indicate that AI applications are increasingly utilized to enhance operational efficiency and risk mitigation in Islamic insurance. Research within this cluster frequently discusses the implementation of AI for fraud detection, predictive analytics, cost optimization, and more accurate financial decision-making processes.

The fourth cluster, highlighted in yellow, focuses on blockchain technology and digital transformation in takaful services. Terms such as blockchain technology, permissioned blockchain, credit, solution, and non-performing assets (NPA) suggest that blockchain has become a significant technological innovation in improving transparency, security, and efficiency within Islamic insurance operations. The integration of blockchain and smart contracts is particularly associated with automated claims processing and the reduction of risks related to data manipulation and information asymmetry.

Finally, the fifth cluster, represented in brown, addresses issues related to financial inclusion and government regulation. Keywords such as government, financial inclusion, researcher, and accuracy highlight the importance of regulatory frameworks and state involvement in supporting the expansion of Sharia-based financial services. This cluster underscores that effective government regulation is essential for ensuring the sustainability

of Islamic insurance systems and for extending access to underserved communities that remain outside the formal financial sector.

Overall, this mapping underscores the multidimensional and interdisciplinary nature of research on AI and Islamic insurance. The identified clusters cover technological innovations, methodological approaches, regulatory frameworks, and broader implications for the Islamic financial industry. The visualization serves as a strategic reference for academics and practitioners, enabling them to recognize emerging research trends and identify promising avenues for further exploration.

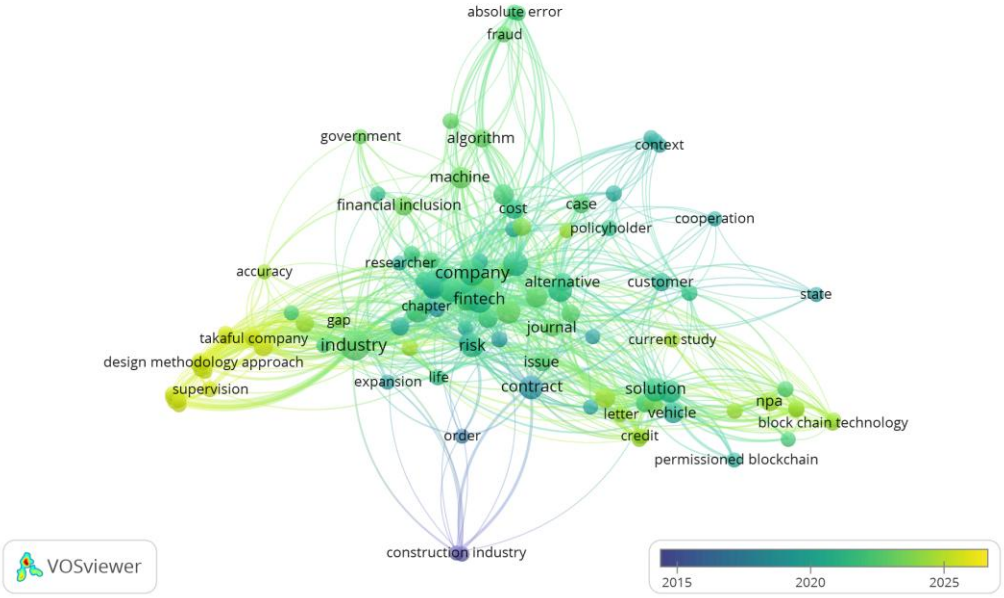

Fig 10. Mapping of Artificial Intelligence and Islamic Insurance Research Topics (Overlay Visualization Mode)

Figure 10 illustrates the mapping of research topics on Artificial Intelligence (AI) and Islamic insurance using the Overlay Visualization mode in VOSviewer. This visualization provides insights into the evolving dynamics of research in this field over time. In this map, a color spectrum is used to indicate the temporal dimension: blue represents earlier studies, whereas green to yellow indicates more recent research. This approach enables a clearer understanding of how scholarly focus on AI and Islamic insurance has shifted in line with technological developments and industry needs.

In the early phase of research (depicted in blue), academic and practitioner attention was largely concentrated on the foundational concepts of Islamic insurance and Islamic finance. Keywords such as *risk, industry, contract, fintech,* and *takaful company* dominated the discourse. Studies from this period primarily explored risk management in Islamic insurance, the design of Sharia-compliant contracts, and the integration of Islamic financial services within the broader fintech ecosystem. The prominence of *takaful company* further suggests a strong institutional and business-model orientation during this stage, with emphasis on developing Sharia-compliant insurance products.

Over time, as technology advanced (represented by the shift from green to yellow), research focus progressively expanded beyond foundational concepts. Newer studies increasingly explored the integration of AI and blockchain to enhance efficiency and transparency within Islamic financial systems. Keywords such as *blockchain technology, machine learning, fraud detection, financial inclusion,* and *permissioned blockchain* emerged with greater frequency, reflecting heightened scholarly and industry interest in digital innovation within the Islamic finance ecosystem.

A particularly notable theme in recent literature is the application of blockchain to improve transparency and efficiency in Islamic insurance transactions. This includes the

implementation of smart contracts—self-executing digital agreements based on pre-determined conditions—which eliminate the need for intermediaries. Within the context of Islamic insurance, *permissioned blockchain* (restricted-access blockchain) has been highlighted for its potential to foster trust among insurers, policyholders, and regulators. This development is closely tied to the growing focus on fraud detection, where AI and machine learning are applied to identify fraudulent claims, thereby safeguarding fairness and compliance with Islamic ethical principles.

Financial inclusion also emerges as a central theme in recent research. From an Islamic perspective, financial inclusion extends beyond access to formal financial services to ensuring equitable access for underserved and unbanked populations, while adhering to Sharia principles. AI and digital technologies are recognized as powerful tools in advancing this agenda—for example, through machine learning–based underwriting models that enable more accurate risk assessments for potential takaful participants.

The visualization also highlights growing attention to issues such as *supervision, accuracy,* and *design methodology approach.* This indicates that scholars and practitioners are not only concerned with the technological adoption of AI and blockchain but also with ensuring that innovations are grounded in rigorous methodologies and aligned with regulatory and Shariah frameworks. The focus on supervision underscores the need for stronger oversight and governance in applying AI and blockchain to Islamic finance.

Looking ahead, this evolving trend underscores significant opportunities for future research. Potential areas include the use of AI in Shariah-compliant risk analysis, the development of blockchain-based smart contracts for Islamic insurance, and the strengthening of AI- and blockchain-driven financial inclusion strategies. These areas not only promise operational efficiency but also align with the Islamic principles of justice, transparency, and inclusivity.

Taken together, the overlay visualization reveals the trajectory of scholarship on AI and Islamic insurance, showing a clear evolution from early emphasis on conceptual foundations toward contemporary explorations of advanced digital applications. This trend signals that the future of Islamic insurance will be increasingly intertwined with AI and blockchain, offering new pathways for innovation in the global Islamic financial industry.

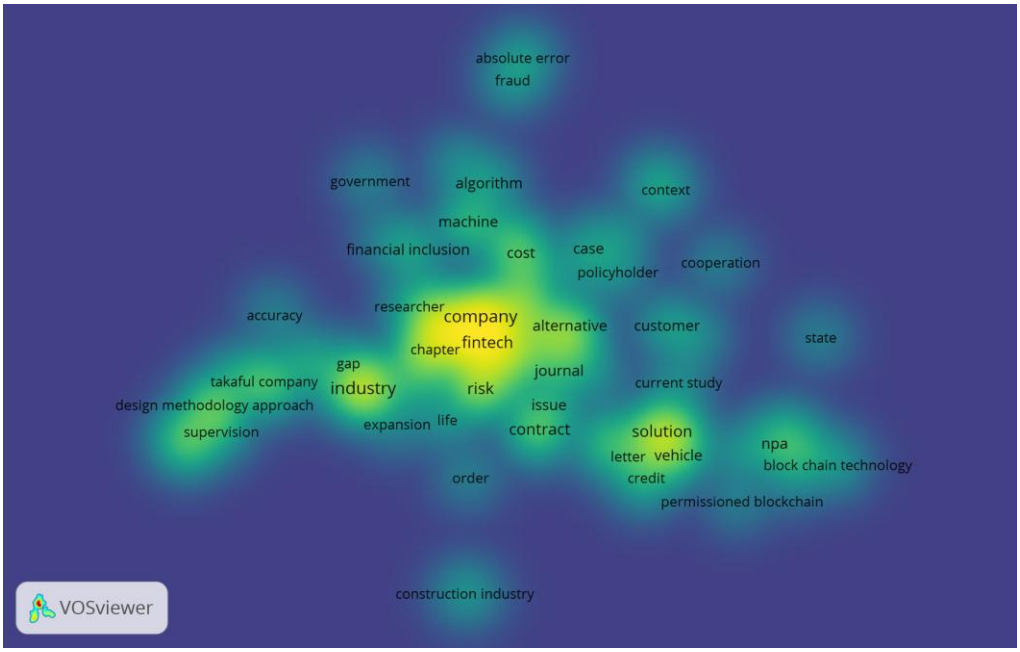

Fig. 11. Mapping of Artificial Intelligence and Islamic Insurance Research Topics (Density Visualization Mode)

Figure 11 presents the mapping of research topics on AI and Islamic insurance using the Density Visualization mode in VOSviewer. This visualization illustrates the relative

intensity of keyword occurrences within the analyzed literature: yellow areas represent frequently occurring terms that dominate the discourse, while green to blue areas correspond to less prominent but emerging themes.

The results show that terms such as *company, fintech, industry,* and *risk* occupy the core with bright yellow density, signifying their centrality in AI and Islamic insurance research. This finding underscores the broad scholarly attention to how companies and the fintech industry are deploying AI in their operations. The prominence of *risk* indicates that risk management remains a primary concern in Islamic insurance, with AI widely applied to improve risk prediction accuracy, support data-driven decision-making, and optimize underwriting and claims processes.

Surrounding these core themes, terms such as *contract, solution,* and *policyholder* appear in greenish-yellow tones, reflecting their growing importance. These keywords point to the increasing focus on AI- and blockchain-based contract management, as well as digital solutions for policyholders. The discussion of blockchain-enabled smart contracts is particularly relevant in this context, given their potential to enhance efficiency, transparency, and Shariah compliance in Islamic insurance. The presence of *financial inclusion* further emphasizes scholarly efforts to explore how AI can expand access to Islamic insurance services among populations underserved by conventional financial systems. This aligns with the principles of Islamic finance that stress justice and inclusivity, highlighting AI's potential role in creating more equitable, accessible, and technology-enabled insurance ecosystems.

At the periphery of the density map, terms with lower occurrence—such as *construction industry, government, state, permissioned blockchain, cooperation, accuracy,* and *order*—signal emerging or underexplored areas of research. For instance, *permissioned blockchain* indicates nascent interest in controlled blockchain systems that combine transparency with privacy and Shariah compliance. Similarly, the emergence of *government* and *state* highlights the growing but still limited academic discussion on regulatory and policy involvement in shaping AI and blockchain adoption in Islamic finance. Meanwhile, keywords such as *cooperation* and *accuracy* suggest the importance of cross-sector collaboration and the need for reliable AI-driven decision-making in Shariah contexts, representing promising areas for future investigation.

This mapping also reinforces the increasing scholarly emphasis on supervision, accuracy, and methodological rigor in recent research. It suggests that beyond technological deployment, researchers are increasingly attentive to governance, validity, and compliance considerations in integrating AI and blockchain into Islamic insurance systems. The density visualization highlights the dominant themes, emerging directions, and potential gaps in current scholarship. It reveals a research trajectory moving toward automation, transparency, and efficiency, underpinned by digital innovation. Future studies are expected to make greater contributions toward building a modern, adaptive, and inclusive Islamic insurance ecosystem firmly rooted in Shariah principles.

3.5 Implications, limitations, and future research directions

The findings of this study offer both strategic and practical implications for the development of Islamic insurance in the digital era. From an academic standpoint, the bibliometric analysis confirms that research on AI in the context of Islamic insurance is still emerging but rapidly growing, thereby providing fertile ground for further scholarly inquiry into its technological, Sharīʿah, and policy dimensions. For regulators and industry practitioners, this study provides a comprehensive overview of the opportunities and challenges associated with AI adoption in Islamic finance. By carefully weighing existing strengths and weaknesses, policymakers can design adaptive regulatory frameworks and foster cross-sectoral collaboration to ensure that AI implementation remains consistent with the objectives of Sharīʿah (*maqāṣid al-sharīʿah*).

Nevertheless, several limitations must be acknowledged. The bibliometric scope was restricted to specific databases and therefore may not fully capture the breadth of

publications dispersed across other journals and repositories. This limitation potentially affects the comprehensiveness and generalizability of the findings. Furthermore, the study has yet to explore in depth the diversity of AI approaches applied in the literature—for instance, comparing the effectiveness of machine learning, natural language processing (NLP), and robotic process automation (RPA) within the context of Islamic insurance.

In light of these limitations, future research should extend bibliometric coverage by incorporating additional databases such as Web of Science and Google Scholar to yield more representative results. Field studies and surveys with Islamic insurance stakeholders at both managerial and technical levels are also needed to enrich conceptual findings with empirical insights into readiness, perceptions, and challenges in AI adoption. In addition, future research should prioritize the development of models or frameworks for AI implementation that are firmly rooted in Sharīʻah principles—for example, leveraging machine learning to provide contextualized interpretations of *maqāṣid al-sharīʻah*.
Exploring the integration of AI with complementary technologies, particularly blockchain, represents another promising avenue, especially in developing smart contracts for claims and policy management in Islamic insurance. Such innovations could enhance transparency, efficiency, and fairness in service delivery. Finally, given the critical role of human capital, future studies should also address digital literacy and capacity building within the Islamic insurance sector, ensuring that the adoption of AI is not only technologically sound but also aligned with Islamic ethical and legal values. With a more interdisciplinary and comprehensive approach, AI can be positioned as a strategic instrument to strengthen the relevance and sustainability of Islamic insurance in an increasingly digital, transparent, and inclusive global financial landscape.

4. Conclusion

Based on the results and discussion, several conclusions can be drawn. First, the total number of publications related to Artificial Intelligence (AI) and Islamic insurance (takaful) amounts to 25, reflecting a steadily increasing trend despite the field still being relatively limited. Second, in terms of authorship, several scholars stand out with two publications each in this area of study, namely Jan, S., Meskini, F.Z., and Mohamed, H. Their contributions demonstrate active engagement in the discourse on AI and Islamic insurance, although the overall number of publications remains modest compared to more established domains. Moreover, the most frequently cited researchers are Alam, Gupta, and Zameni, whose influential work *Fintech and Islamic Finance: Digitalization, Development and Disruption* (2019) has received 86 citations. This study addresses a broad range of issues related to financial technology (fintech), including innovations in digital payments, smart contracts, and the disruptive impact of technology on Islamic finance. The high citation count underscores the centrality of this topic in ongoing discussions on the future of Islamic finance in the digital era.

Third, regarding publication outlets, *Lecture Notes in Networks and Systems* and *The Future of Islamic Finance: From Sharīʻah Law to Fintech* emerge as the most prominent sources, each hosting five publications. This highlights their role as key platforms for academics and researchers to disseminate studies in Islamic financial technology and the application of digitalization in the Islamic economic system. In terms of institutional affiliation, Stellar Consulting Group Ltd. records the highest number of publications (four), suggesting a strong research focus on AI and Islamic insurance, most likely in developing AI-driven risk analysis tools and efficiency mechanisms in Islamic finance. At the country level, Malaysia leads with 12 publications, reflecting its dominant role and strong commitment to prioritizing AI and Islamic insurance as fields of scholarly and industrial relevance.

Fourth, topic mapping reveals that *fintech, risk, company, contract, industry, design methodology approach, supervision, takaful company,* and *gap* constitute the central themes of research, closely linked to subtopics such as *machine, algorithm, cost, fraud, absolute error, blockchain technology, permissioned blockchain, credit, solution,* and *non-performing*

assets (NPA). This indicates that the field is highly diverse and multidisciplinary, spanning technological, regulatory, methodological, and industrial dimensions of Islamic finance. Emerging themes such as *blockchain, financial inclusion, supervision, accuracy,* and *design methodology approach* have gained prominence in recent years and are likely to continue developing in the near future. At the same time, the density visualization highlights less-explored but promising areas, such as *construction industry, government, state, permissioned blockchain, cooperation, accuracy,* and *order,* which present opportunities for future research.

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Author Contribution

The author confirms that all aspects of this research—including conceptualization, methodology, data curation, formal analysis, visualization, writing (original draft preparation, review, and editing), and project administration—were carried out solely by the author. The author has read and approved the final version of the manuscript.

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Informed Consent Statement

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Conflicts of Interest

The author declare no conflict of interest.

Declaration of Generative AI Use

During the preparation of this work, the author used ChatGPT (OpenAI) to assist in improving the manuscript's grammar, clarity, and academic tone. After using this tool, the author reviewed and edited the content as needed and takes full responsibility for the publication's content.

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