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The Evolution and Development Trends of International Insurtech Based on Citespace Analysis

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Abstract

The digital transformation of the insurance industry is progressing rapidly, with Insurtech emerging as the primary driving force and gaining significant academic attention. Using CiteSpace software, this study conducts a visual analysis of the global literature on Insurtech indexed in the Web of Science (WOS) database, aiming to explore the evolution of research, core hotspots, and future directions in this field. The findings indicate a significant increase in publications in this field from 2019 to 2024, reaching an annual peak in 2024. Research institutions, such as the University of Washington and the National Bureau of Economic Research (NBER), serve as core research bases, with research hotspots focusing primarily on cutting-edge areas, including "insurance," "banking," "technology adoption," and "artificial intelligence." The current research network has yet to form a systematic, integrated collaboration framework, and the intensity of collaboration between institutions and scholars requires further enhancement.

Keywords: InsurTech, CiteSpace, Technology Adoption

As a crucial component of the financial technology (Fintech) sector, Insurtech represents a transformative shift in the insurance industry, driven by technological advancements and evolving customer demands in the digital era (Nguyen, 2023). With the rapid development of technologies such as artificial intelligence, big data, blockchain, and the Internet of Things, the insurance industry is transitioning from its traditional reliance on statistical data to acquiring richer, individual-level data, which enables more precise risk management (Roh et al., 2024; Sadowski, 2024). Through technological innovation, Insurtech has reshaped the operational model of the insurance industry, addressing key challenges such as complex access procedures, cumbersome claims processes, and high premiums (Muttaqiin et al., 2022). Therefore, research on insurtech deeply not only helps understand its role in improving the efficiency, flexibility, and customer satisfaction of insurance services (Bittini et al., 2022).,

but also reveals its importance in driving the formation of new business models, such as the "on-demand insurance" and "usage-based insurance" models, which can better meet the personalized needs of consumers (Gai et al., 2018).

Global investment data shows that investments in the Insurtech sector surged from USD 4.23 billion in 2018 to a peak of USD 15.8 billion in 2021. While investment has slightly declined in the past two years, a tri-polar pattern has emerged, with North America leading, Europe accelerating its development, and the Asia-Pacific region on the rise (CB Insights, 2023). Although the global investment in the Insurtech sector shows a strong growth trend, there is a scarcity of literature specifically focusing on insurtech (Cosma & Rimo, 2024), which deserves more attention and the development of a dedicated research field (Zarifis & Cheng, 2022). This study will adopt the Citespace method to conduct a professional analysis of insurtech-related literature over the past decade, aiming to systematically sort out research directions and present the knowledge graph of insurtech research. This method can not only reveal the research hotspots and development trends in this field but also point out directions for future research, providing valuable references for the academic community.

From a practical perspective, this study will provide practical insights and strategies for industry practitioners, investors, and policymakers. By understanding the latest developments and trends in insurtech, all parties will be better able to seize market opportunities and promote the sustainable development of the insurance industry. By advancing research on Insurtech, it is expected to guide the entire industry toward a more efficient and customer-centric direction, thereby achieving the dual improvement of economic and social benefits.

Data Sources and Research Methods

Data Sources

This study uses the Web of Science (WOS) database as the data source, with a time frame from January 1, 2016, to May 1, 2025. A total of 1,437 articles were retrieved by searching for the terms "Insurtech" or "insurance technology." After excluding duplicates and publications from unrelated fields, such as science and technology and medicine, 797 relevant articles were retained for further analysis.

Research Tools and Methods

CiteSpace enables quantitative analysis of the co-occurrence networks in literature (e.g., keywords, authors, institutions), thereby objectively revealing the research structure and evolutionary trends within a field. Its cluster analysis function evaluates cluster quality through metrics such as Modularity Q and Mean Silhouette, effectively grouping a large volume of heterogeneous literature into thematic clusters with clear structure and high internal consistency, thus facilitating the systematic organization of the knowledge system (Chen, 2016).

Additionally, CiteSpace's unique "Burst Detection" algorithm identifies terms with sudden increases in citation frequency or keyword intensity over specific periods, offering a distinct advantage in capturing emerging trends and research hotspots in Insurtech, an evolving field. Furthermore, CiteSpace supports data import from mainstream databases, such as Web of Science, and generates intuitive and easy-to-understand knowledge graphs.

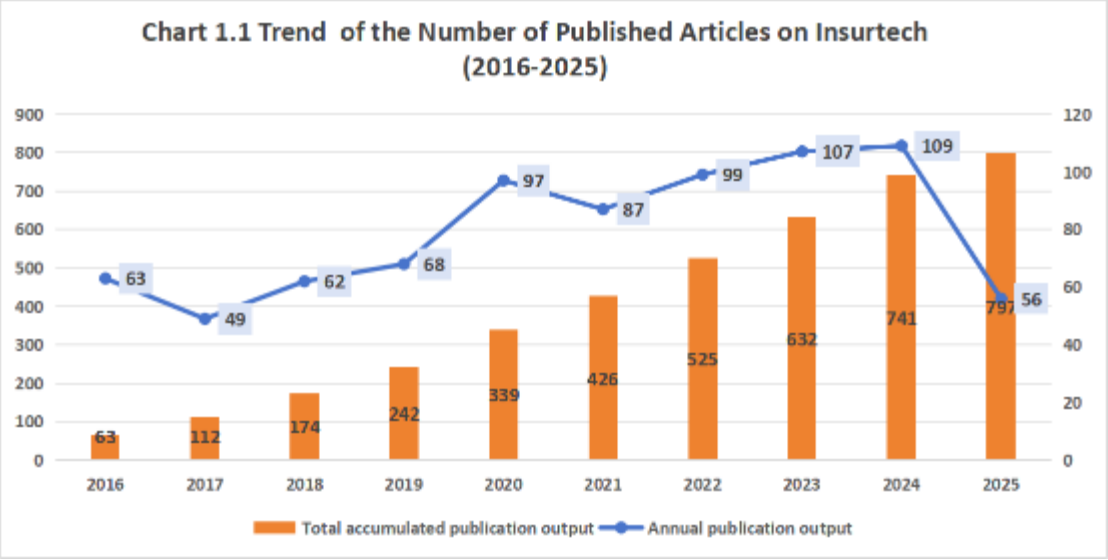
This makes it an ideal tool for researchers to quickly comprehend the overall landscape of insurance technology research, the collaborative networks of key stakeholders, and the status of knowledge flow.

Analysis of the Current Status of Research Literatures

Overview of Basic Information

Figure 1.1 illustrates the annual and cumulative number of publications on insurance technology-related literature over the past 10 years (2016–2025). As shown in the figure, research on insurance technology is primarily divided into two phases. The first phase, from 2016 to 2019, saw the annual number of publications remain around 60. The second phase, from 2019 to 2024, marked a period of rapid growth in insurance technology research, with the annual publication count consistently around 100. For 2025, only data from the first five months has been recorded, yielding 56 articles. It is projected that the total number of publications for the entire year will slightly exceed that of 2024.

The trend in the number of publications suggests that, following the global outbreak of COVID-19, an increasing number of insurance institutions began digital transformation (Lanfranchi & Grassi, 2022). Insurtech, which is closely associated with this transformation, has experienced rapid development, and research on insurance technology has reached its peak.



Analysis of Research Entities

National Co-occurrence Analysis

Through a national co-occurrence analysis, the contributions of different countries to this field and their collaborative relationships can be identified. A total of 797 publications in the field of "insurance technology" were imported into CiteSpace, with "country" selected as the analysis dimension. No map pruning options were applied, and the time slice was set to "3," while all other settings remained at their default values. The results are presented in Figure 1.1.

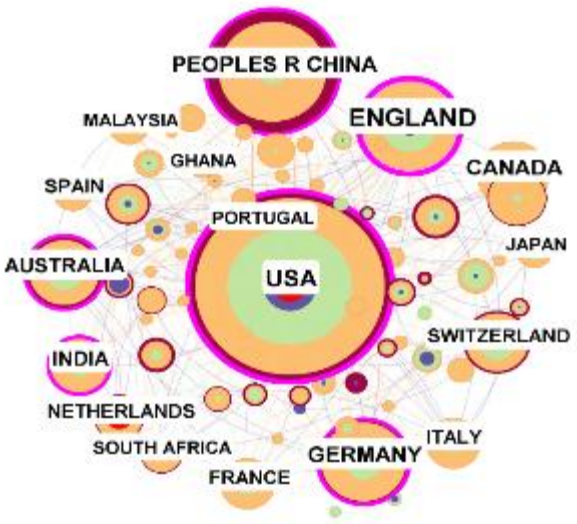


Figure 1.1: National Co-occurrence Map of Insurance Technology (2016-2025)

The national co-occurrence map includes 89 nodes and 344 links. Each node represents a country, and the size of a node corresponds to the number of publications from that country in this field. As shown in Figure 1.2, the United States has the highest number of publications in the field of "insurance technology" (290 articles), indicating a significant advantage in this area (Umran, 2025). It is closely followed by China, with 129 articles, reflecting the rapid development of China's insurance technology sector in recent years. This growth has attracted considerable attention from researchers and investors, and its innovation activity is also high (Alfawareh & Al-Kofahi, 2024).

Among the countries ranked 3rd to 6th, the United Kingdom, Germany, Australia, and Canada have demonstrated significant academic strength in this field, with 69, 64, 48, and 41 publications, respectively. Research in these countries typically covers a broad range of insurance technology topics, from fintech innovation to data analysis. Notably, among the countries with fewer than 40 publications, 20 countries have published only one article each. This likely reflects the relatively late start of research in these nations or insufficient resource investment in the field.

In addition to publication volume, the collaborative relationships between countries are also evident. Countries with more publications tend to have closer academic cooperation. For example, the United States and the United Kingdom share a relatively dense cooperative network, indicating a tendency for the two countries to share resources and achievements in the field of insurance technology. Such international cooperation not only facilitates the dissemination of knowledge but also promotes technological innovation and application.

Institutional Co-occurrence Analysis

In analyzing the institutional cooperation network in insurance technology research, the visualized results of the institutional co-occurrence map provide an essential perspective on the academic landscape of this field. As shown in Figure 1.2, the institutional co-occurrence map consists of 284 nodes and 215 links. The number of nodes reflects the scale of institutions

involved in the research, while the number of links indicates the strength of the cooperative relationships between institutions. Specifically, each node represents a research institution, and the size of the node is positively correlated with the number of publications by the institution. In other words, the larger the node, the more publications the institution has contributed to this research area. The thickness of the links between nodes represents the intensity of cooperation; the thicker the link, the closer the cooperation between institutions.

In terms of institutional contribution, Southwestern University of Finance and Economics and the National Bureau of Economic Research (NBER) tied for first place, with 16 publications each. These two institutions, located in China and the United States, respectively, align with the publication performance of their respective countries. Together, they constitute the core research force in this field. Following closely are the University of Illinois (12 publications), the University of Washington (11 publications), the University of Pennsylvania (11 publications), and Tamkang University (10 publications). These four institutions form the second echelon of insurance technology research. Additionally, institutions such as the University of California, Davis, the University of St. Gallen, and Cornell University have also demonstrated significant involvement, reflecting the global vitality of insurance technology research.

Further analysis of the inter-institutional cooperation network reveals that, although 284 institutions are involved, the network density is relatively low, with only 215 links. The institutions publishing research are mainly concentrated in the United States and Europe, with relatively loose cooperation with those in Asia, Africa, and other regions. Most institutions focus on independent research, and cross-institutional academic collaboration and resource integration remain limited.

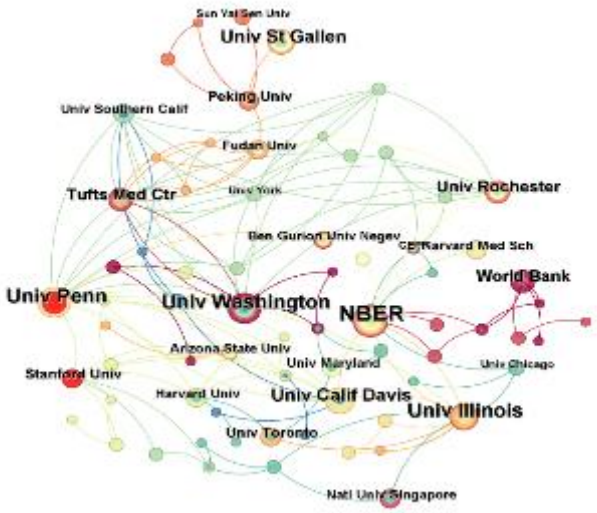


Figure 1.2: Institutional Co-occurrence Map of Insurance Technology (2016-2025)

Analysis of Hotspots and Trends

Keyword Co-occurrence

As a condensed representation of the core content of academic literature, keywords and their co-occurrence characteristics can effectively reveal the research focus and developmental context of a discipline. Based on co-occurrence theory, a keyword co-

occurrence analysis was conducted on 797 publications using the CiteSpace visualization tool. The “Pathfinder” algorithm and the “Pruning the Merged Network” technique were employed to optimize the complex network. The resulting keyword co-occurrence map (Figure 1.3) contains 340 nodes and 1,188 links, providing a visual foundation for identifying the research characteristics of this field.

From the perspective of keyword frequency distribution (Chart 1.1), "insurance" and "technology" rank first, with the highest occurrence frequencies of 116 and 114, respectively, highlighting their prominent status as core research themes. They are closely followed by "impact" (93 occurrences), "risk" (84 occurrences), "performance" (58 occurrences), and "technology adoption" (57 occurrences). The emergence of these high-frequency keywords not only indicates their prominence in academic discourse but also outlines the development trajectory of insurance technology research, from technological empowerment (insurance, technology) to specific implementations (impact, adoption). In terms of keyword betweenness centrality, "information technology" occupies the central position in the network with a centrality value of 0.12, reflecting its key role as a research hub and its extensive, close associative interactions with other keywords. "Adoption" (0.09), "model" (0.09), "technology" (0.08), and "care" (0.08) rank second to fifth in centrality, with these high-centrality keywords connecting multiple research dimensions, including technological innovation, industry entities, and application scenarios.

Table 1.1
Frequency and Centrality of Keyword Co-occurrence in Insurance Technology

Number	Frequency	Centrality	Year	Keywords
1	116	0.04	2016	insurance
2	114	0.08	2016	technology
3	93	0.07	2018	impact
4	84	0.03	2017	risk
5	58	0.04	2020	performance
6	57	0.09	2019	technology adoption
7	52	0.09	2016	adoption
8	46	0.09	2020	model
9	42	0.08	2022	care
10	38	0.12	2019	information technology

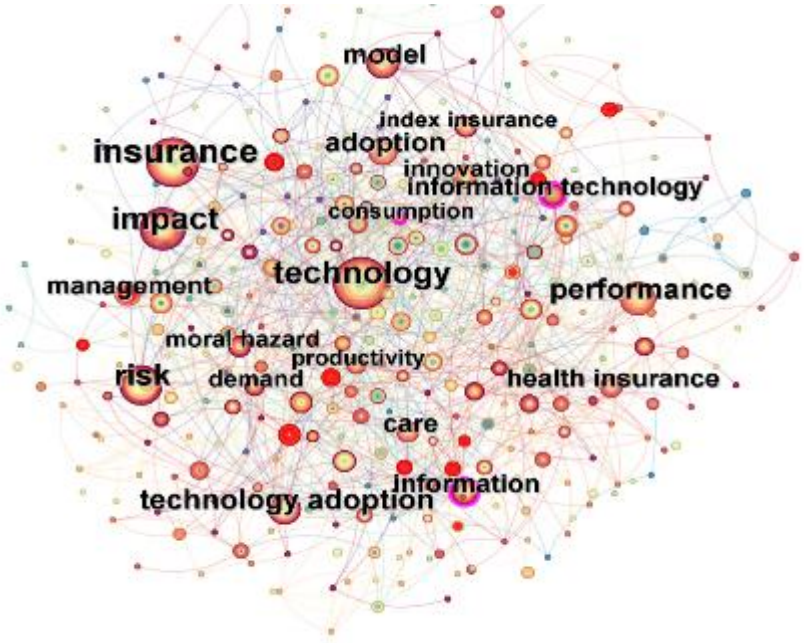


Figure 1.3: Keyword Co-occurrence Map of Insurance Technology (2016-2025)

As shown in Figure 1.3, high-frequency keywords such as “insurance,” “technology,” “technology adoption,” “impact,” “risk,” “management,” and “operational efficiency” are prominently displayed as larger nodes, forming the core concept cluster of the research field.

Overall, the distribution of high-frequency and high-centrality keywords on the map not only reflects the stable position of “Insurtech” as the main research focus but also highlights insurance companies' strong interest in adopting insurance technology and their key areas of attention. Furthermore, there is a close link to industries like healthcare and nursing. The strong interconnection between these nodes confirms the high thematic cohesion within the insurance technology research field and reveals the development of a research network with a clear hierarchy and multidimensional links around core concepts. This structure offers a clear logical framework for further research.

Keyword Cluster Analysis

As a key tool for revealing the knowledge structure of scientific research, the keyword cluster view clearly illustrates the distribution of research hotspots and their interconnections by examining the semantic associations and co-occurrence patterns among keywords. Based on the 797 publications, the Log-Likelihood Ratio (LLR) algorithm was employed for keyword cluster analysis. This algorithm screens cluster labels through statistical significance tests to ensure the labels accurately represent the cluster content. The visualization results (Figure 1.4) show that different color blocks represent independent cluster modules, with the spectral color scale corresponding to the average publication year of literature within the clusters. Keywords within the same cluster exhibit high consistency in terms of semantic meaning and research context, while frequently appearing keywords define the core research topics of the period.

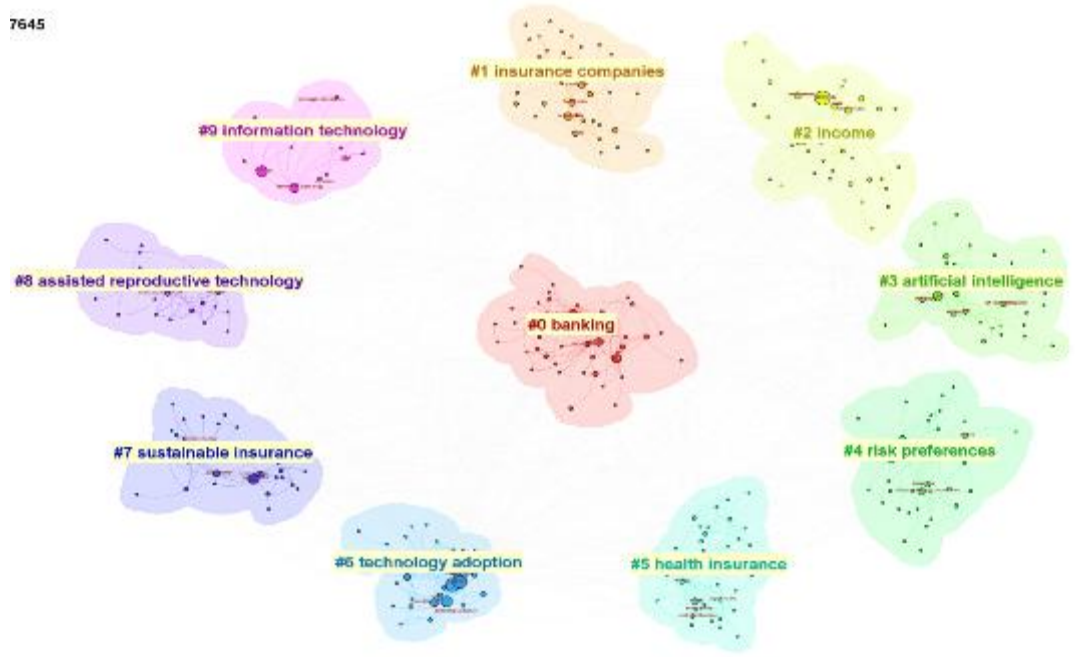


Figure 1.4: Keyword Co-occurrence Map of Insurance Technology (2016-2025)

Through cluster analysis, a total of 10 research modules were identified: #0 Banking, #1 Insurance Industry, #2 Income, #3 Artificial Intelligence, #4 Risk Preference, #5 Health Insurance, #6 Technology Adoption, #7 Sustainable Insurance, #8 Assisted Reproductive Technology, and #9 Information Technology. The modularity Q value is 0.4092 (higher than the critical value of 0.3), indicating that the cluster network structure is relatively significant and reasonably divided; the average silhouette value reaches 0.7337, which shows that each cluster has extremely high internal homogeneity and the cluster results are highly reliable. These cluster modules encompass application areas such as technological empowerment (e.g., Artificial Intelligence), model innovation (e.g., Health Insurance, Sustainable Insurance), and subject-specific research (e.g., Banking, Insurance Industry), as well as interdisciplinary fields like Health and Assisted Reproductive Technology. They map out the thematic landscape and developmental trajectory of international insurance technology research from 2016 to 2025, offering a theoretical framework and strategic guidance for future studies.

Research Conclusions and Prospects

Research Conclusions

Over the past decade, Insurtech, a significant branch of the fintech sector, has attracted widespread attention from both the academic community and industry. According to CiteSpace analysis, the number of publications in Insurtech research has seen substantial growth since 2019. In particular, amid the global trend of digital transformation, the number of publications reached 741 in 2024. The United States continues to dominate research in this field, with 290 publications, 161 more than China, which ranks second, highlighting the U.S.'s strong research capabilities in this area. China's recent research in Insurtech also mirrors the rapid development of the country's Insurtech industry. Although the number of publications from other countries has not surpassed 100, their research scope is broad, indicating global attention on Insurtech.

At the institutional level, seven of the top 10 research institutions are based in the United States. Globally, while several institutions have demonstrated active research, cross-institutional and interdisciplinary collaboration remains limited, and a cohesive academic community has yet to form.

Through keyword co-occurrence analysis, this study identifies multiple research hotspots within the Insurtech field, including digital transformation, sustainable insurance, artificial intelligence, and data analysis. These hotspots reflect the industry's evolving external environment and the growing emphasis on meeting consumers' personalized needs. For example, the frequent mention of "digital transformation" suggests that insurance institutions are actively adopting new technologies to improve operational efficiency and enhance customer experience. Simultaneously, the focus on "sustainable insurance" highlights the growing emphasis on environmental responsibility and social impact. Additionally, the rapid development and application of artificial intelligence underscore the insurance industry's pressing demand for efficient risk assessment and claims settlement processes.

In summary, the Insurtech field is currently undergoing rapid development. Future research should prioritize deeper cooperation mechanisms and technological innovation to ensure the sustainable growth of Insurtech.

Research Prospects

The Disconnection between Theory and Practice Calls for In-depth Cooperation

Although academic research on Insurtech has increased, the interaction between theoretical research and industry practice remains insufficient. Many research outcomes fail to be effectively transformed into practical applications, making it challenging for the innovative solutions proposed in theory to be implemented in the industry. For example, while some scholars have proposed personalized insurance pricing models based on big data analysis (Eti et al., 2024), many insurance companies still rely on traditional risk assessment methods and have not fully leveraged the potential of new technologies. This disconnection between theory and practice undermines the innovation capacity of the insurance industry and limits the widespread application of these technologies.

To bridge this gap, greater collaboration between academia and industry is essential. For instance, universities can partner with insurance companies to establish corporate internship programs, enabling students to engage with the latest Insurtech innovations in real-world settings. This will provide valuable two-way feedback for both parties. Additionally, creating industry collaboration platforms is another effective strategy. These platforms can host regular academic-industry exchange conferences, inviting experts and scholars to discuss the latest research and industry needs, fostering an open space for dialogue. Introducing case studies and empirical analysis methods is also vital. Some enterprises have begun using case studies, such as analyzing the application of the "on-demand insurance" model in different markets, to help scholars better understand the challenges and opportunities in real-world applications.

By grounding academic research in real-world examples, this approach aligns research with industry needs, enhancing the practical relevance of theoretical work. Ultimately, by promoting closer interaction and cooperation between academia and industry, the gap

between theory and practice can be narrowed, accelerating the development of the Insurtech sector and better equipping it to meet the rapidly changing market demands.

Cross-institutional and Interdisciplinary Cooperation Needs to Be Enhanced

The lack of cross-institutional and interdisciplinary collaboration hampers resource sharing and knowledge exchange, limiting the full potential for innovation and practice opportunities. Leading academic institutions might excel in big data analysis but struggle with designing practical insurance products or implementing strategies. Conversely, some insurance companies have deep insights into market practices and customer needs but lack effective links to academic research. This "information and resource silo effect" diminishes research efficiency and weakens the industry's overall capacity for innovation.

To address this issue, establishing cross-institutional cooperation networks is crucial. By fostering collaborative research projects between institutions, the link between academia and industry can be strengthened. For example, dedicated funds or awards could be created to support interdisciplinary research projects, encouraging researchers from diverse fields to contribute to Insurtech-related studies. These incentives would attract more researchers, broaden their research perspectives, and foster deeper integration across disciplines.

Limitations of Current Research Hotspots

At present, the research hotspots in the Insurtech field primarily focus on technological applications and digital transformation, while critical topics such as the social impact and ethical implications of Insurtech remain underexplored. This focus leads to a narrow research perspective that fails to capture the broader societal consequences of Insurtech. For instance, while the application of new technologies in risk assessment and claims processing has greatly improved efficiency (Cosma & Rimo, 2024), more research is needed to address the impact of these technologies on customer privacy, data security, and their role in promoting social equity.

To improve this situation, interdisciplinary research is essential. Researchers in fields such as sociology, economics, and ethics should collaborate with Insurtech experts to conduct more comprehensive studies. By combining expertise from these diverse areas, researchers can better understand the social effects and challenges associated with Insurtech. Additionally, academic journals and conferences should expand their scope to embrace a wider range of research topics, focusing on issues such as climate change, social equity, and customer privacy. By increasing research in these areas, both the industry and academia can gain more nuanced insights and solutions, offering valuable guidance for the development of Insurtech. In this way, research can contribute not only to the practical operations of businesses but also to the sustainable growth of the industry and the overall well-being of society.

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