



A BIBLIOMETRIC ANALYSIS ON EMERGING TECHNOLOGIES IN THE INSURANCE INDUSTRY

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Abstract: Insurtech, which stands for "insurance technology," refers to technology and innovation with the primary purpose of providing better services and technology to the insurance business in today's progressive technological environment and industrial revolution. That industry is increasingly reliant on technology to gain a competitive advantage, and it helps decision-makers make sound decisions. We employ bibliometric analysis to evaluate the trends in insurance technology. We examined all Scopus-indexed publications linked to insurance technology, totaling 568 articles, using keywords relevant to insurance technology in the titles, keywords, and abstract. Microsoft Excel is used for frequency analysis and data visualisation, as is the VOS viewer. We use the following bibliometric indicators: publication year, document type, source type, keyword analysis, authorship, and citation analysis. Since 2017, the number of publications on insurance technology has increased dramatically. The expanding number of Insurance Technology publications highlights the importance of technology in the insurance industry, which will surely have an impact on the economy and society. Keyword analysis suggests that employing insurance big data in diverse studies necessitates a theoretical link between the Insurance Technology issue and the insurance contract, which could be a future research topic.

Index Terms - Insurance technology, Insurtech, Bibliometric Analysis, Scopus database, Digital innovation

I. INTRODUCTION

Our daily lives are infiltrated by technology and the innovation it allows. Customers expect the same digital experience with insurance as they do with financial transactions and life management via the internet and mobile devices. The unification of the financial infrastructure should result in lower costs and a more efficient financial market. Any internal control system must be adaptive to changes in the commercial, operational, and regulatory environments in order to meet new and fast changing business models, increased usage and dependence on technology, increasing regulatory requirements and audits, globalisation, and other challenges.

The digital transformation of insurance is only a part of the revolution brought about by insurance technology. "Data science," "big data," and "AI" (including machine learning approaches such as deep learning) began as buzzwords in actuarial science. The concept of leveraging non-traditional data and sophisticated analytics is now widely accepted and regarded as a critical component of insurance technology.

Insurance technology uses cutting-edge hardware, software, and user interfaces to address inefficiencies or opportunities in the insurance value chain, which commonly combines technology, data, and analytics. Insurance technology focuses on the evolution/disruption of: (a) insurer-customer interactions; (b) process automation; and (c) the modification or invention of new insurance products.

The word "Insurtech" is usually used in combination with "Insurance technology startups," but it can also refer to a "ecosystem of focused, innovation-driven enterprises.". By defining insurance technology as the junction of industry specificity and maturity, we can put the concept into context. At one end of the industry specificity spectrum, technology solutions can be applied broadly across multiple sectors, whilst at the other end, the concentration is on a single insurance product. We monitor firms at various stages of maturity, from startups to established enterprises that have been offering or using technology solutions for decades.

Despite the recent global rise and application of the Insurtech business, the literature on bibliometrics in insurance technology is underexplored, both theoretically and empirically. As a result, we intend to provide a full bibliometric analysis of the current state of research on Insurtech, insurance technology, and Scopus indexes. In specifically, we examine bibliometric variables such as publishing year and yearly growth, document type, source type, keyword analysis, authorship, and citation analysis for insurance technology research. The study's findings reveal the present state of academic study in the topic, which might inform future research. Researchers interested in undertaking study in this field can determine which subjects have received the greatest attention, allowing them to identify crucial themes and gaps in the literature.

Problem Statement

Over the last several decades, researchers have done numerous surveys and assessments of the insurance industry and the transformation brought about by insurance technology. Despite the recent global rise and application of the Insurtech business, the literature on bibliometrics in insurance technology is

underexplored, both theoretically and empirically. As a result, a bibliometric study will provide a thorough approach for researching articles on the topic of interest.

Aim of the Paper

The paper's aim is to provide a detailed bibliometric study of the current state of research on insurance technology indexes in Scopus. For this objective, bibliographic techniques were used to provide analysis and knowledge about the technology revolution in the insurance sector and its implications. Using VOS viewer software, global research patterns from 2017 to 2024 were summarised and used to direct future studies.

Research Contribution

The paper raises an interesting issue that requires due consideration from all parties involved. The current insurance trend focuses on technologies and their use in existing industries. The current literature has contributed to insurance and technology innovation in the insurance business individually. However, the purpose of this research is to identify published materials on the two issues combined and to shed light on gaps in the literature addressing the topic of interest. As a result, the study serves as a good reference for researchers seeking to discover trend themes in technological innovation in the insurance business and indirectly set out both subjects individually.

Paper Structure

The paper is divided into the following sections. The first portion introduces the research and its objective, while the second concentrates on the methodology and literature review. Furthermore, the third section presents the results of the bibliometric analysis. The fourth section includes a discussion of the findings and the study's conclusion.

II. METHODOLOGY

A bibliometric study is used to examine the data collected on the chosen topic. This literature evaluation is an important contribution to insurance technology research because it provides a systematic method of study selection (Briones-Bitar et al. 2020; Herrera-Franco et al. 2021; Montalván-Burbano et al. 2021). As a result, the advice presented can help to reduce potential biases and inaccuracies when selecting research studies for a literature review. Furthermore, the results of the current literature can be utilised to emphasise the limitations of knowledge in the chosen study field and identify the research gap more effectively.

The bibliometric analysis used the similarity visualisation technique. This type of visualisation is known as bibliometric mapping, and it allows you to see connections in the scientific field structure in terms of authors, countries, documents, keywords, and other scientific production factors (Briones-Bitar et al. 2020; et al. 2021). The bibliometric analysis was divided into three stages: data collection; software and data cleaning; and analysis, interpretation, and visualisation.

Data Compilation

The first stage was searching the Scopus database for comprehensive publications. The database comprises papers from a variety of subjects, including business, computer science, law, psychology, history, education, philosophy, medicine, and many others, with some dating back to the 1800s. The article search was divided into multiple steps, each of which included a variety of commonly used terms. Documents were considered relevant to the study if they contained the word "argument" in their title. The final search argument was as follows: the search was conducted in March 2024, yielding 586 document results from 2017 to 2024 using these search criteria.

Software and Data Cleaning

In the second stage, the collected articles were examined with the VOS viewer. The information gathered during the first stage was saved to an Excel spreadsheet for analysis and organisation. The constructed database included a variety of parameters such as author names, cited publications, journal titles, and keywords. Furthermore, the papers were clustered, and clustering solutions were shown. Clustering is a method of analysis that groups things based on their similarity or difference (Chen et al. 2016; Nobanee 2021). Thus, keywords retrieved from publications that had a high association with one another were placed in an appropriate cluster.

Publications were clustered based on their relatedness. The decision was made between the two most common bibliometric analysis methodologies, namely citation or word relations. Cluster identification for this work was carried out using the word relations approach, which uses related words in full texts of publications, abstracts, and titles (Van Eck and Waltman 2017; Nobanee 2020). Furthermore, the bibliometric approach based on word relations was used due to the numerous benefits that this type of analysis gives for the research aim. Co-word analysis identified linkages between concepts used to examine the Insurance technology field in order to understand the existing status of research concepts and predict where future research should be performed. However, the co-word method to bibliometric analysis has certain challenges. Certain words may have varied meanings depending on the context, resulting in an inaccurate representation of publications from distinct domains. Furthermore, certain phrases are broad and can be applied to research in a variety of fields, providing no useful information about the relatedness of articles (Van Eck and Waltman 2017). Hence, while evaluating the study results, it should be considered that clusters may comprise keywords that do not have a strong semantic relationship.

The VOS viewer programme was used to examine clustering solutions at an aggregate level using a term-map. A word map visualises the subjects covered by each cluster (Van Eck and Waltman 2017). This visualisation allows you to emphasise the key terms that appear in publications inside a cluster, as well as the co-occurrence of relationships between these terms. A key assumption of clustering is that items in the same cluster represent comparable subjects. In addition to the co-word analysis, which was deemed the core focus of the literature review, cluster analysis was used to examine other aspects of publications, such as authors and cited papers. Cluster analysis of word relations revealed three groups of subjects addressed in the chosen publications. Items in distinct clusters are shown in different colours, and each point on the term map is

assigned a colour based on the density of keywords at that location. As a result, more prominent points signified a greater weight for neighbouring words, and vice versa.

Analysis, Interpretation, and Visualization

The final stage was a careful inspection of the highlighted clusters. All qualitative data from each article was exported into an excel file and then integrated into ad hoc pivot tables. The total connection strength for each publication's attributes was determined, demonstrating multiple publications where two elements appear together (Guo et al. 2019). The literature review was conducted using the resulting tables and visualisation maps.

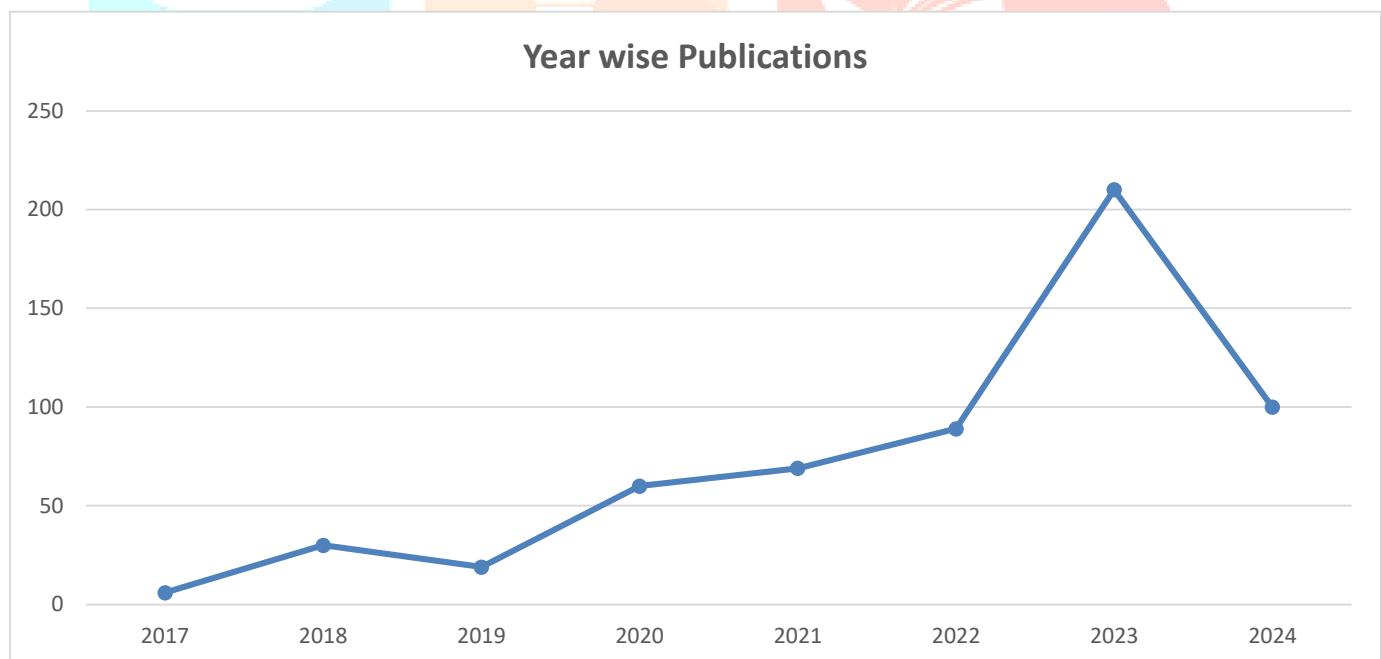
III. RESULTS AND LITERATURE REVIEW

The bibliometric results were divided into two groups. The first portion examined scientific production, including article features such as time distribution, authors, and referenced papers. The second phase of the literature review focuses on cluster analysis and identifying current streams using the keywords that have been determined.

Scientific Production Analysis

- **Time Distribution**

Figure 1



Source: Compiled from collected data.

Figure 1 depicts the time distribution of articles across the observed period, which ranged from 2017 to 2023. Gutzwiller's first study on Insurance Technology looked into whether insurance firms should fund a low-cost programme (technology) as part of their policies. There has been limited development in the number of publications devoted to Insurtech, and for several years, there was just one article on the subject until it acquired popularity in 2017. Since then, the annual number of publications on Insurtech has increased significantly. This statistic illustrates that the biggest number of papers, so far, on insurance technology was

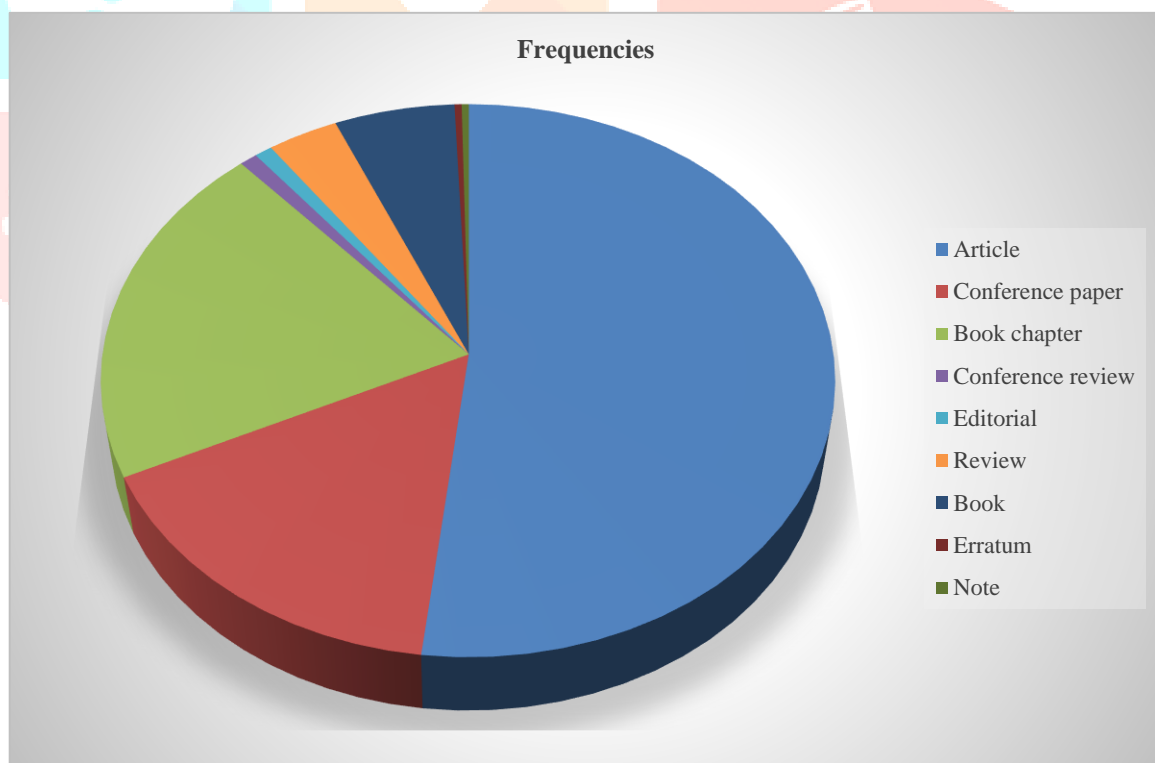
in 2023, which was 210 articles, or roughly more than a quarter of total paper on insurance technology. The number is expected to rise by 2024 as the industry undergoes a widespread upheaval. The use of technology in the financial services industry during the COVID-19 epidemic had a tremendous impact on the insurance company. As a result, insurance companies began establishing business continuity plans to ensure the provision of essential insurance operations, with an emphasis on the delivery of digital services.

The current interest in ethical insurance applications, as well as the insurance industry's technology development, are driving this expansion. The majority of research on insurance technology focus on the digital transformation of the insurance business and its impact on client behaviour, insurance company profitability, and the country's economy. The temporal distribution study results confirm scholars' growing interest in insurance technology, as well as the topic's novelty.

- **Document source and type**

We examine the documents collected from the Scopus database using the document type, source type, and source title. A document can be a published paper, a conference paper, a review, a book, a book chapter, an editorial, or something else. Figure 2 summarises the document type analysis. Over half (52%) of Insurtech works are published, with conference papers (16%) and books and book chapters (21%), respectively.

Figure 2

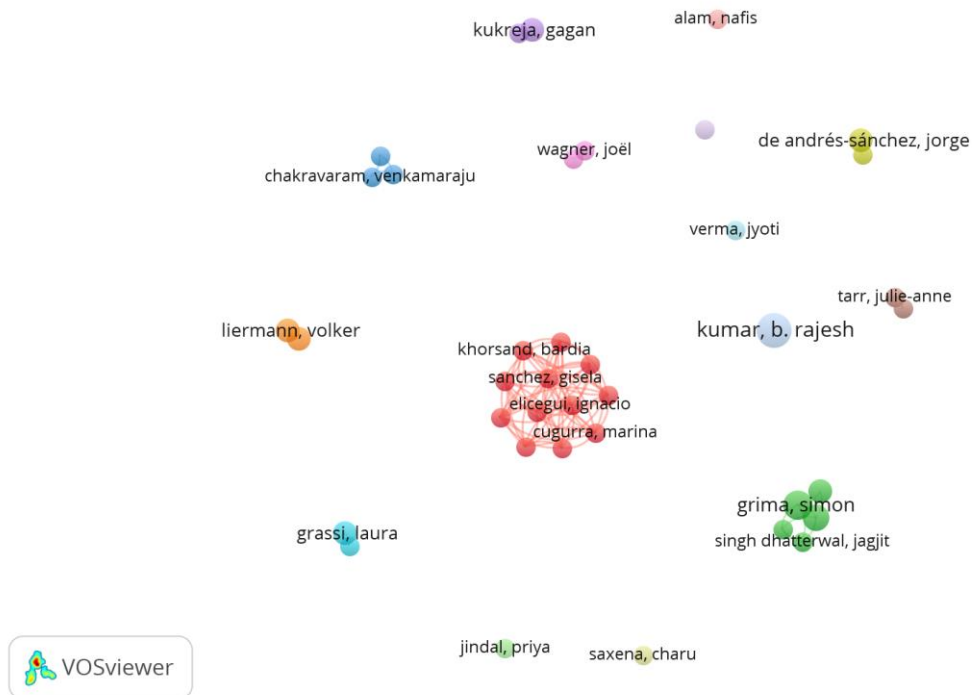


Source: Compiled from collected data.

- **Authors**

The literature review comprised a total of 586 writers. Figure 3 shows the authors who have at least three articles in the dataset. Thus, the most publications were contributed by Grima, Simon (6 papers), followed by Sood Kiran (5 papers). The remaining writers in the list were the authors of three and four studies (refer to Table 3). Figure 3 depicts the cluster distribution of authors based on their number of publications.

Figure 3



Cluster Analysis and Current Streams

Keyword cluster analysis was used to represent and compare the content of the most popular articles, which included the author's keywords. Furthermore, the frequency with which terms appeared was used to identify the current streams and topics employed in the chosen research field. Table 1 shows the top 15 keywords with the highest frequency of occurrence. Thus, the following terms appeared most frequently in the article titles: insurtech (106 occurrences), fintech (105 occurrences), insurance (62 occurrences), block chain (50 occurrences), and artificial intelligence (35). The VOS viewer programme also generated a theme map in which words with density appeared. The high keyword density in the cluster analysis indicates a strong link with other keywords stated in the articles' titles.

Table 1

Top 15 Key Words Mentioned in the Articles.

Keyword	Occurrence	Total Link Strength	Rank
Insurtech	106	203	1
Fintech	105	197	2
Insurance	62	138	3
Block Chain	50	128	4
Artificial intelligence	35	93	5
Big data	22	50	6
Smart Contracts	15	43	7

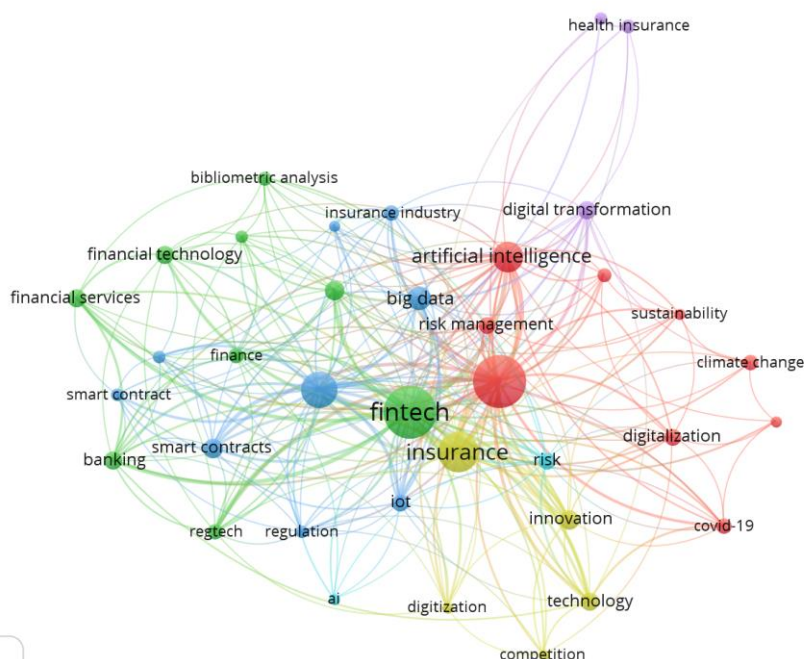
Machine learning	15	36	8
Innovation	14	38	9
Technology	13	46	10
Banking	13	42	11
Digital Transformation	13	32	12
Financial Services	13	28	13
Financial technology	13	25	14
Digitalization	11	21	15

Source: Compiled from collected data.

Figure 4 depicts the similarity results, demonstrating how the clusters are all interconnected. As a result, the search string was effective since the boundaries of interconnections are blurred and bordering articles represent themes from multiple clusters. Figure 4 shows that six groups of keywords were highlighted.

The first cluster is marked in red and contains nine elements. As evidenced by the VOS viewer output in Figure 4, these terms garnered the most attention from researchers studying insurance technology. Cluster 1 keywords include artificial intelligence, blockchain technology, climate change, COVID-19, digitalization, financial inclusion, Insurtech, risk management, and sustainability. Furthermore, the second cluster is marked in green and contains nine elements. This cluster's most relevant keywords include banking, bibliometric analysis, deep learning, finance, financial services, financial technology, fintech, machine learning, and reg-tech. The third cluster is outlined in blue and contains nine elements.

Figure 4



The most commonly used words include big data, blockchain, cloud computing, cryptocurrency, and insurance industry. The fourth cluster is highlighted in yellow and contains five elements. The important words in this cluster are competitiveness, digitization, innovation, insurance, and technology. The sixth cluster is marked in purple and contains three elements. The most commonly used keyword in the cluster is digital transformation. Finally, the sixth cluster is highlighted in light blue, which includes phrases like AI and danger.

Content Analysis

The content analysis focuses on critical publications that were highlighted throughout the literature review. As a result, a summary of relevant papers was produced.

According to the data, a fraction of the contributed insurance articles are about technical innovation in insurance and its impact on the sector. Furthermore, some studies were dedicated to the transformation of insurance technology (Volosovych et al., 2021), digital innovation in the insurance industry such as blockchain technology, data science, and AI, and their impact on operational performance, social consequences, and the economy (Gatteschi V et al., 2018), (Brophy R. 2020), and (Amponsah A.A. et al., 2021).

Clearly, the existing literature is insufficient to cover the topic of innovation in insurance technology because most articles focus on financial technologies, regtech, BancTec, and the adoption of technologies and behaviour of the insurance policyholder industry; additionally, articles generally discussing digital innovation in the insurance industry are scarce. However, there are no articles in the database on digital innovation in the insurance business that develop a concept of its dissemination in the current market and what aspects remain to be addressed. As a result, there is a gap in the existing literature on the subject since it does not adequately support the insurance industry's technological revolution in industrialised and sustainable economies.

IV. DISCUSSION OF RESULTS

The application of bibliographic cluster analysis resulted in a literature study of papers on insurance technology, financial technology, digital innovations, and life insurance. According to the scientific output study, the gathered publications have shown a trend of increased publication between 2017 and 2023. As a result, in recent years, researchers have become increasingly concerned about insurance technology.

During the recent publication growth, the United States concentrated significantly on the following aspects of insurance: technology and digital innovations on organisations' performance, sustainability, and profitability. Their research did not focus on the clients' reactions to these digital developments in insurance services. For example, Amponsah et al. (2021) have been observing block chain technology since the first generation's application in fintech and demonstrate how investing in block chain technology might benefit the insurance business. Additionally, Gatteschi et al. (2018), Raikwar et al. (2018), and Brophy et al. (2020) emphasised block chain technology and its impact on the insurance business. On the other hand, a number of papers have been published that focus on the impact of digital technology on the insurance industry, such as

Cao L et al., (2021), which focused on data science and AI, and their critical role in driving modern economies, society, and technology in the areas of Fintech, BancTec, and Insurtech.

Insurance technology study themes are generally drawn from business, management, accounting, computer science and economics, econometrics, and finance. Other academic disciplines, including social sciences, engineering, decision sciences, and mathematics, are also interested in the subject. Our data reveals that, as the number of publications increases year after year, so does the average number of authors per manuscript. To some extent, this pattern suggests increased collaboration among authors in the field. According to co-citation, the partnership resulted in four major themes: InsurTech development, the FinTech environment, InsurTech effect, and InsurTech's SDGs.

Our findings show that the impact of insurance technology on the financial performance of insurance firms and other entities, such as insurance brokers, loss adjusters, and insurance agents, has not been addressed. The examination of keyword occurrence and paper citations reveals that insurance contracts are an emerging area that needs to be researched. As a result, there is need for more research in this field. Insurance technology also influences the development of new insurance contracts. It can be used, for example, to construct contracts that are more user-friendly or flexible. InsurTech might also collaborate with RegTech to assist insurers manage their insurance contracts more efficiently. Furthermore, the theoretical link between insurance technology and numerous businesses has been suggested as a prospective research issue.

Despite the important insights provided by our study, readers should be aware of its limits. This study employed certain query/keywords to compile an initial list of scholars' works published and indexed by Scopus. This strategy has been used extensively in prior bibliometrics studies. Scopus is one of the most comprehensive online databases for indexing scholarly publications, however it does not include all available sources. As a result, some exclusions in this study are to be expected. Furthermore, no search query is suitable for gathering all scholarly publications in an area. As a result, false positive and negative results are likely.

V. CONCLUSIONS

A bibliometric analysis provides a complete system for evaluating papers focusing on technological advancements in the insurance sector. The Scopus Database was utilised to gather information for the bibliometric technique based on co-word analysis. A total of 586 papers were acquired between 2017 and 2024.

According to the frequency of scientific output analysis, critical nations of publication, journals, authors, organisations, referenced publications, and study subjects were identified. This stage created a description of the important qualities found in the obtained articles. Furthermore, the cluster analysis of co-word relations identified 37 elements that were most commonly utilised in the article titles and created a map of their interconnection. These objects were grouped into six clusters, each with a high degree of interconnection.

The research provided an overview of the insurance industry's digital revolution. However, evolution tendencies indicate that this field of study is still in its infancy, and more research is needed. To address the

limitations of the current study, future research should collect papers from a more comprehensive list of databases. Furthermore, a bibliographic coupling strategy is advised for identifying interrelationships between publications. This approach is likely to improve the overall effectiveness of future literature reviews in the insurance industry.

VI. ACKNOWLEDGMENT

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