

The adoption of AI in the Egyptian insurance sector. potential opportunities and challenges: A Systematic Review of published articles

By:

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2025-09-21	تاريخ الإرسال
2025-10-01	تاريخ القبول
https://jsst.journals.ekb.eg/	رابط المجلة:

Abstract:

The insurance sector worldwide has seen a significant processing. the demand for data Constructing accurate artificial intelligence models is crucial for analysing and predicting this data for the future. This study aims to review research on AI tools by restricting it to the insurance sector. A systematic literature review has been conducted with a sample of publications in the Insurance context. We analyze within the study of the selected papers the advantages and disadvantages of AI in the insurance industry, the AI techniques and the methods currently used. According to the research results, the advantages of AI adoption include efficient claims processing, AI enables insurers to evaluate and price insurance risks more accurately, fraud detection, and customer experience enhancement. However, the disadvantages may include poor- quality or biased data, leading to inaccurate or misleading outputs that will affect risk claims processing, and assessment, customer satisfaction. In Egypt, addressing these challenges and suggesting solutions that may help tackle those challenges is crucial for successful adoption of AI in the insurance industry.

Keywords: Ai, "systematic review", "Egyptian Insurance sector", Insurance



1. Introduction:

The insurance industry is heavily dependent on risk using mathematical and statistical assessment methods (Nejla Ellili a, The applications of big data in the insurance industry:, 2023). The advent of advanced AI technologies, along with innovations like Machine Learning (ML), Big Data, cloud computing, biometrics. cybersecurity behavioral solutions. automation (such as chatbots and voice bots), quantum computing, and metaverses, assists insurers globally in streamlining their risk evaluations and predictions, thereby saving time. These technologies also offer benefits such as enhanced customer service, cost reduction, improved security, personalized offerings, and a competitive edge. Nonetheless, these technologies come with drawbacks, including high costs for implementation and upkeep, increased business risks, and issues of immaturity instability, as AI technologies are often nascent and underdeveloped, potentially leading to instability. There are also cybersecurity risks, regulatory challenges due to stringent and sometimes outdated regulations that can impede ΑI technology and development, reliance implementation external providers that may result in loss of data control, and the need for specialized skills, which can increase costs for hiring and retaining skilled Additionally, is personnel. there a risk dehumanizing services, which may not be wellreceived by all customers, and digital exclusion, as AI technologies can contribute to digital exclusion, particularly among older, less educated, or rural populations who may find it difficult to adapt to new technologies. There is also the potential for misuse, with risks of data breaches and unauthorized data use (Nowak5, 2023). Regarding AI's role in the insurance industry, the swift advancement of AI could lead to the automation of various functions. including marketing, customer service, underwriting, and claims management. Since insurance is a trustbased business, automation might reduce consumer

trust because, despite AI's impressive results in insurance, many algorithms are "black box" in nature and lack transparency, which could diminish trust. Furthermore, the data collection required to power algorithms might be flawed or inaccurate. The solution to this challenge is to develop algorithms transparently (Rad1, 2021). The use of explainable artificial intelligence (xAI) techniques should aid risk managers in comprehending how models generate their predictions, thereby allowing them to identify patterns and gain insights that might not be immediately apparent in the raw data. These explanatory AI methods are clearer and more interpretable and this will help risk managers to gain a deeper understanding of the models' limitations and potential biases. This understanding leads to more decision-making and benefits organization's stakeholders. (Lluís Bermúdez 2023). Alongside the significance of trust in the insurance sector is the necessity of regulations to financial exclusion risks such as information asymmetry for consumers. The Commission's European ΑI Act the **International Code of Conduct for Organizations** Developing Advanced AI Systems serve as valuable guidelines. The insurance market could suffer due to the excessive use of data, especially if this data is misused or sourced from unreliable origins. Such harm can be reduced by enhancing the transparency of the underwriting process and the data sources insurers rely on. This transparency will help build customer trust in insurance. (Zofia Bednarz a, 2022). AI technologies can revolutionize areas in insurance, such as fraud detection, using systems like SISBAR, an innovative fraud detection system for insurance based on blockchain and machine learning SISBAR assists insurance firms in algorithms. reducing claim losses, resulting in savings for customers who comply with legal requirements (NAJMEDDINE DHIEB1, 2020). Customer segmentation can be conducted by The Cross



Industry Standard Process for Data Mining (CRISP-DM), that is an AI technology method. AI can enhance customer segmentation and boost customer (CRM). relationship management **Typical** segmentation criteria include demographic details (such as age, gender, and occupation) and contractrelated factors (like insurance premium and type of insurance) (Kyeongmin Yuma, 2022). In the realm of health insurance fraud detection, AI is utilized through wearable devices worn by customers for real-time health monitoring and fraud prevention. Data from these wearables is encrypted, stored, and learning using machine algorithms analyzed integrated with blockchain to ensure secure and transparent fraud detection (KHYATI KAPADIYA1, 2022). Another area where AI proves beneficial is in longevity risk, which enhances managing precision of mortality forecasts. For decision trees and random forests have been applied to improve the Lee- Carter and Renshaw- Haberman models, resulting in more accurate mortality predictions. Neural Networks have also shown superior performance in predicting mortality trends compared to traditional models. AI can diminish information asymmetry between insurers policyholders, enhance longevity risk quantification, and facilitate real-time automated decision-making Levantesi (Italy), 2020). **Analyzing** (Susanna consumer behavior using Explainable Artificial Intelligence is another area in insurance that employs AI to improve communication and understanding between insurance providers and consumers. The methodology,(XGBoost)combined with agnostic interpretability tool (Shapley Values), results in effective segmentation of customer profiles, both in terms of purchasing and churn behaviors (Giudici, 2020). AI models like Elegant Cleaning and Labeling of Insurance Policies while Standardizing Entities (ECLIPSE) aid in data preparation, leading to time savings and more effective loss model building (Varun Sriram *, 2023). Robo-advisors are increasingly utilized in insurance for tasks such as customer communication and providing advice (Pierpaolo Marano 1, 2023).

AI carries risks, including vulnerability to adversarial attacks by external parties on ΑI Adversarial attacks are a form of complicated insurance fraud. These parties can misuse the data inputs (text, images, etc.) to deceive AI systems. Insurance companies need to enhance their analytical capabilities and adopt a balanced approach between AI autonomy and human oversight, following a comprehensive strategy to improve AI robustness and protect against adversarial attacks (Behnaz Amerirad 1, 2023). This study explores application of artificial intelligence in the insurance sector. By systematically reviewing the existing literature, it examines AI's influence on policyholder experience, risk evaluation, internal processing performance, fraud monitoring, and claims management. Findings highlight emerging trends and future directions for integrating AI into insurance practices. This analysis offers valuable insights for scholars, industry professionals, and policymakers especially in Egypt, where the AI adoption is in its early stage. This study has two main objectives. First, it presents an up-to-date overview of recent advancements in the application of artificial intelligence within the insurance industry. By systematically reviewing the latest literature, it identifies emerging opportunities and challenges associated with AI applications. Second, the review examines existing research to find gaps in knowledge and highlight areas requiring further investigation in the insurance industry This study is structured as follows. First we start with the explanation the methodology of this research. Next, the presentation of the results of the systematic review in terms of publication growth and most cited documents. Finally we introduce the conclusions of this study. Additionally, the limitations of this research study is presented to give insight for future research.



2. Methods

This study employs a systematic review, a quantitative approach, to conduct comprehensive analysis, map and visualize publications and contributions related to the development of AI in insurance. (Nejla Ellili a, The applications of big data in the insurance industry:, 2023)

This systematic review was conducted by applying the reporting checklist of the Preferred Reporting Items **Systematic** Reviews Metaand (PRISMA). All the papers published in the range between 2019 and 2024 in the field of AI in insurance have been reviewed. We utilized Scopus database to review the papers published containing the term "AI AND INSURANCE" in their titles, while the date is restricted in the range between 2019 and 2024 to get the most recent papers in the selected field. We only took into consideration the papers in English language. we export the title, abstract, authors' names and affiliations, journal name, and year of publication of the identified records to an MS Excel spreadsheet. Then, these selected papers were carefully examined. This study can improve the knowledge of practitioners, especially in the Egyptian insurance sector about the recent advancements in the AI technologies used in the insurance sector that could reshape the insurance industry in Egypt.

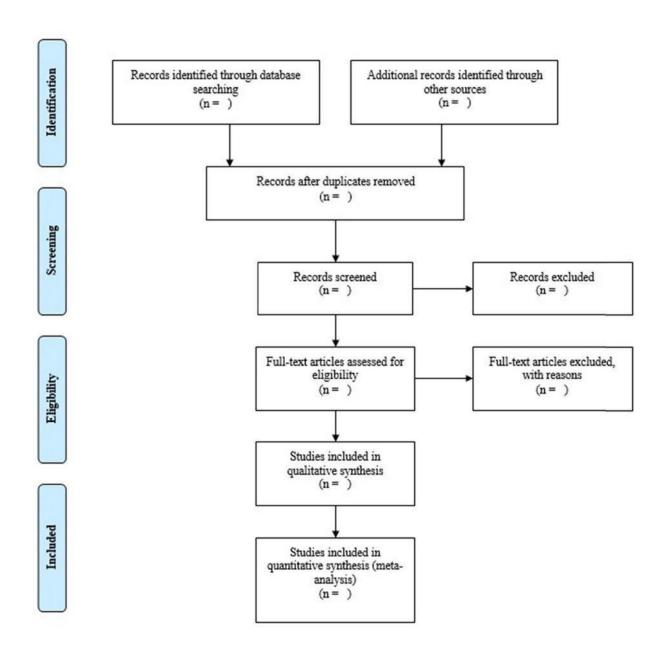


Fig.1: The Prisma flow diagram



3. Results

A total of 129 papers were reviewed in the current study, with the selection process summarized in Figure 2. An initial search in the Scopus database brought out 1,007 records, of which 878 were excluded for being unrelated to the research scope. The full texts of the remaining articles were screened, resulting in the exclusion of 91 papers that did not meet the predefined selection criteria.

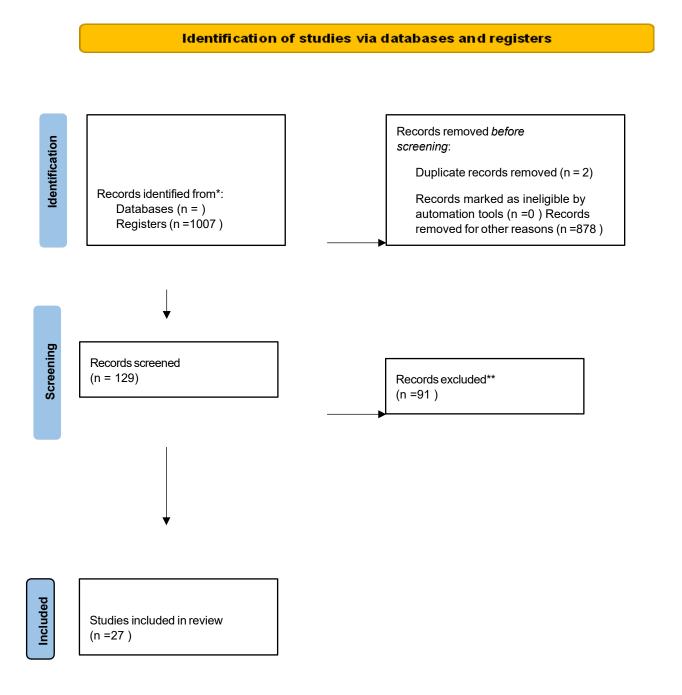


Fig. 2: The flow chart of the selection process

Table 1 reports the titles, journals name and year of publication of included in Appendix A.



The findings show gradual increase in research focused on the application of artificial intelligence in the insurance sector.

To synthesize the current landscape applications in the insurance sector, this systematic review identified and analyzed 129 peer-reviewed articles spanning diverse methodologies, geographic contexts, and thematic focuses. The selected studies were evaluated based on their relevance parametric insurance, basis risk management, and technological innovation, with particular attention to their applicability in urban resilience frameworks. Table 1 presents a structured summary of the most pertinent contributions, highlighting each study's core focus, methodological approach, and potential relevance to Alexandria's windstorm context. This tabular synthesis not only facilitates comparative analysis but also underscores emerging trends and gaps that inform the development of localized parametric models tailored to Egypt's regulatory and climatic realities.

For a comprehensive overview of the selected studies, see Appendix A.

4. Results

4.1. Publication growth:

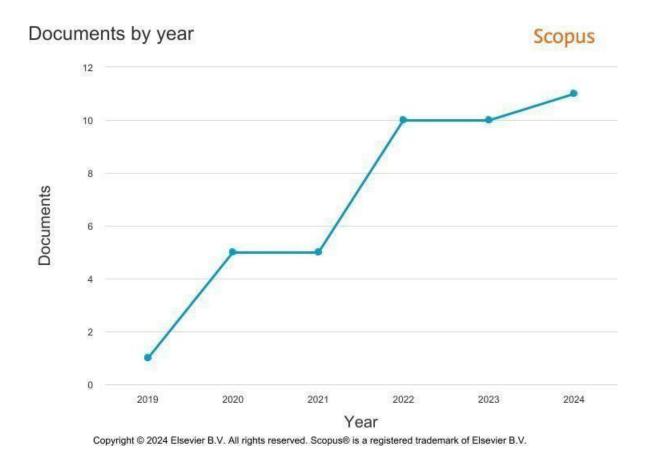


Fig.3: The publication growth



A total of 1,007 documents related to artificial intelligence and insurance were retrieved from the Scopus database. Following a screening process, 42 papers were selected for inclusion, encompassing both open-access and subscription-based publications. Figure 2 illustrates the evolving research trends in this domain. Notably, only one paper was published in 2019, with the number of annual publications steadily increasing to reach 11 by 2024. This upward trend reflects growing scholarly interest in the use of AI and insurance—an emerging field that continues to attract global academic attention and is expected to expand further in the coming years.

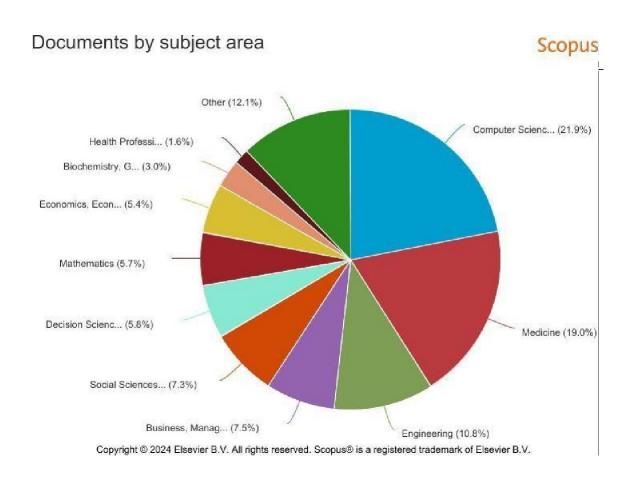


Fig.4: distribution of documents by subject area

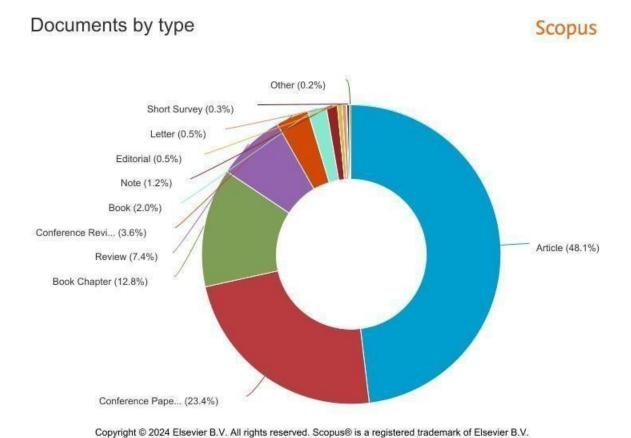


Fig.5: Distribution of documents by type

The figures reveal distinct patterns across the reviewed publications. Specifically, Figure 5 highlights that journal articles constitute the predominant format within the research landscape on AI and insurance.

4.2 Citation analysis

The Scopus database was used to find and rank the most cited journal articles on the topic. This helps future researchers quickly identify the most useful studies about AI and insurance, making it easier to understand the field and know where to start (see Table 2).



مجلة البحوث المالية والتجارية - المجلد (26) - العدد الرابع - أكتوبر 2025

Publicationear	Document Title	Journal Title	132
2021 Re-Evaluating Trust and When Purchasing a Mobile App	Journal of Internet Commerce P	rivacy Concerns	28
2020	Why to buy insurance? An explainable artificia	Risks	28
2024 A hybrid framework using ex	plainable AI (XAI) i Decision Sup	oport Systems	10
2022	Determinants of emerging technologies adopt	South African Journal of Business M	10
2023 Explaining Policyholders' Chatbot Accepta Journal of Theoretical and Applied El			
2021	Risk assessment for personalized health insur	Risks	9
2022 Hidden depths: The effects of	extrinsic data coComputer Law a	and 6 Security Review	
2021	Transparency and insurance professionals: a s	Geneva Papers on Risk and Insuranc	6
2020 How AI, data science and tech	hnology is used t Research in Wo	rld 6 Economy	
2023	Regulating Robo-Advisors in Insurance Distrib	Risks	5
2020 Longevity risk management t	hrough Machine LInsurance Mark	xets 5 and Companies	
2023	Adversarial Artificial Intelligence in Insurance:	Risks	3
2024 INTEGRATION OF DIGITA and Credit Activity: Proble	L MEANS IN THE FINA Financ	ial 2	
2020	Effective system for prediction of heart diseas	International Journal of Scientific an	2

Table 2: Citation overview

5. Limitations

This paper has some limitations. First, all the documents in the review were taken only from Scopus, since it's the most widely used research database. This means studies from other sources were not included. Second, the analysis was based only on the titles of the papers and English language, which may have limited the depth of the findings. This provides a foundation for future research to build upon.

6. Conclusion

Insurance industry has been revolutionized by artificial intelligence, which has enhanced customer service, risk analysis, operational processes, and fraud detection. Insurers can achieve precise risk pricing and offer personalized products by analyzing structured and unstructured data. customer behavior allows insurers to develop personalized policies and marketing strategies, thereby improving customer relationships retention. AI is also instrumental in identifying fraudulent activities, speeding up investigations, and reducing financial losses. Furthermore, AI's ability to monitor customer health data leads to the creation of tailored health plans. This significant influence of AI on the insurance sector has led to this systematic review that delves into its various applications, offering valuable insights for industry professionals policymakers especially in the Egyptian insurance market.



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APPANDIX

Explaining Policyholders' Chatbot Acceptance with an Unified Technology Acceptance and Use of Technology-Based Model	2023 Journal of Theo retical and Applied Electronic Commerce Research	
How AI, data science and technology is used to fight the pandemic COVID-19: Case study in Saudi Arabia environment	2020 Research in World Economy	
Adversarial Artificial Intelligence in Insurance: From an Example to Some Potential Remedies	2023 Risks	
Risk assessment for personalized health insurance based on real-world data	2021 Risks	
A hybrid framework using explainable AI (XAI) in cyber-risk management for defence and recovery against phishing attacks	2024 Decision Support Systems	
An Information System Supporting Insurance Use Cases by Automated Anomaly Detection	2023 Big Data and Cognitive Computing	
INTEGRATION OF DIGITAL MEANS IN THE FINANCIAL SPHERE: THE POTENTIAL OF CLOUD COMPUTING, BLOCKCHAIN, BIG DATA AND	2024 Financial and Credit Activity: Problems of Theory and Practice	
Why to buy insurance? An explainable artificial intelligence approach	2020 Risks	
Effective system for prediction of heart disease by applying logistic regression		
New technologies in the financial industry: Case of Poland	2020 International Journal of Scientific and Technology Research	
	2023 Economics and Business Review	
Determinants of emerging technologies adoption in the South African financial sector	2022 South African Journal of Business Management	
ECLIPSE: Holistic AI System for Preparing Insurer Policy Data	2023 Risks	
Transparency and insurance professionals: a study of Swedish insurance practice attitudes and future development	2021 Geneva Papers on Risk and Insurance: Issues and Practice	
Evaluating If Trust and Personal Information Privacy Concerns Are Barriers to Using Health Insurance That Explicitly Utilizes Al	2021 Journal of Internet Commerce	
Regulating Robo-Advisors in Insurance Distribution: Lessons from the Insurance Distribution Directive and the AI Act	2023 Risks	
Three Horizons of Technical Skills in Artificial Intelligence for the Sustainability of Insurance Companies	2024 Administrative Sciences	
Hidden depths: The effects of extrinsic data collection on consumer insurance contracts	2022 Computer Law and Security Review	
DETERMINANTS INFLUENCING THE ADOPTION OF ARTIFICIAL INTELLIGENCE TECHNOLOGY IN NON-LIFE INSURERS	2024 Corp orate Governance and Organizational Behavior Review	
RESEARCH TRENDS IN INSURANCE RISK FROM 2000–2022: A BIBLIOMETRIC ANALYSIS OF THE LITERATURE	2024 Risk Governance and Control: Financial Markets and Institutions	
Longevity risk management through Machine Learning: state of the art	2020 Insurance Markets and Companies	
Economics of Healthy Aging in India: A Multidimensional Perspective	2022 IZA Journal of Labor Policy	
CROP INSURANCE PREMIUM RECOMMENDATION SYSTEM USING ARTIFICIAL INTELLIGENCE TECHNIQUES; [SISTEMA DE RECOMENDA]	2023 International Journal of Professional Business Review	
Addressing the notion of trust around ChatGPT in the high-stakes use case of insurance	2024 Technology in Society	
Neuropsychiatric manifestations of post COVID-19 Syndrome and Disability Insurance (DI); [Covid long neuropsychiatrique et assuran	2023 Revue Medicale Suisse	
Explainable AI for paid-up risk management in life insurance products	2023 Finance Research Letters	
Al-powered decision-making in facilitating insurance claim dispute resolution	2023 Annals of Operations Research	
Al Insurance: How Liability Insurance Can Drive the Responsible Adoption of Artificial Intelligence in Health Care	2023 NEJM Catalyst Innovations in Care Delivery	
Application of Al-based Customer Segmentation in the Insurance Industry	2023 Asia Pacific Journal of Information Systems	
COMPETITIVE ADVANTAGE IN LIGHT OF ALTO ACHIEVE INNOVATIVE AS A KEY OF THE SDGS; PALESTINIAN INSURANCE INDUSTRY	2023 Journal of Lifes tyle and SDG'S Review	
Prediction machines, insurance, and protection: An alternative perspective on Al's role in production	2023 Journal of the Japanese and International Economies	
Current status and future prospects of AI diagnosis in the gastrointestinal field —from development to regulatory approval and insuran	2023 Journal of Japa nese Society of Gastroenterology	
Responsible and human centric Al-based insurance advisors	2023 Information Processing and Management	
Al-Driven livestock identification and insurance management system	2023 Egyptian Informatics Journal	
Al Insurance: Risk Management 2.0	2023 IEEE Technology and Society Magazine	
Payment protection insurance. The doctrine of freedom of contract and the role of the independent regulatory authorities; [Auto ed ete	2023 Osservatorio del Diritto Civile e Commerciale	
Blockchain and Al-Empowered Healthcare Insurance Fraud Detection: An Analysis, Architecture, and Future Prospects	2023 IEEE Access	
Digitalisation and sustainability - legal challenges for the insurance sector, especially with regard to the use of AI; [Digitalisierung und	2023 Zeitschrift für die gesamte Versicherungswissenschaft	
A Secure Al-Driven Architecture for Automated Insurance Systems: Fraud Detection and Risk Measurement	2023 IEEE Access	

Table 1: A summary of the titles, names of the journals and year of publication of the included papers.