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The Role of Smart Actuarial Calculations in Improving the Quality of Financial Reports of the Iraqi Insurance Company

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Abstract:
The research aims to explore the role of actuarial calculations supported by artificial intelligence technologies (smart actuarial calculations) in enhancing the accuracy and quality of financial reporting. Companies face challenges related to the accuracy, transparency, and speed of preparing financial reports, necessitating innovative solutions based on smart technologies. The research analyzed the literature and employed an exploratory methodology to study the impact of smart actuarial calculations on the integrity of financial reports. The association between the application of artificial intelligence and professional standards and their impact on the performance of insurance companies and financial reporting practices was also examined. The researchers concluded that smart actuarial calculations enhance the quality of financial reports by increasing accuracy and speed, providing comprehensive analyses, reducing costs, and increasing efficiency through the reduction of human errors and precise risk analysis. These calculations also enhance compliance with accounting standards, build shareholder and stakeholder confidence, and emphasize the importance of professional standards and actuarial guidelines to ensure the quality of work. The research recommended improving the utilization of artificial intelligence in developing actuarial calculations, providing continuous training for experts, adhering to professional standards to ensure transparency and reliability, and encouraging future studies to investigate the implications of smart technology in the accounting and insurance fields. This research contributes to accounting literature by providing insights into artificial intelligence's role in developing actuarial calculations and improving insurance sector performance.
Keywords: Actuarial Calculations, Artificial Intelligence, Financial Reports, Quality of Financial Reports, Transparency.

1. Introduction:

Actuarial experts are still indispensable because actuarial estimates are the core of insurance companies .Due to the lack of work that has explored this important field, it has received the attention of many researchers. (Abbas et al., 2022) Actuarial studies are among the most important studies used in insurance companies. Through these studies, mathematical models and foundations are created to calculate premiums and assess risks in the context of life insurance (Khalidiya, 2015).

The concept of an actuarial expert is unique and distinctive in the insurance industry (Balona, 2024) and actuarial accounting is a science that includes mathematics, statistics, accounting, computers and legal knowledge. It is concerned with providing studies and statistics to decision-makers, whether operational or capital, to help them make rational decisions (Jamil, 2016).

Actuarial work in the context of artificial intelligence (AI) currently focuses on developing AI agents to perform complex tasks that may be difficult or impossible to perform manually due to their complexity and the time and effort required, thereby enhancing efficiency and effectiveness (Yeo et al., 2019).

Artificial intelligence is the foundation of Industry 4.0 in the digital world, as it enables machines to adapt, learn from experience and make decisions based on new inputs to perform tasks related to human behaviors. These advanced technologies make it easier for organizations to collect huge amounts of data, improving the ability to identify data patterns (Falana et al., 2023), (Miller, 2019), (Dagunduro et al., 2023). The use of big data and artificial intelligence in insurance has become inevitable. Despite concerns about discrimination and privacy, the market continues to rely on these technologies to improve the accuracy of service and the role of actuarial science (Lior, 2021).

Recently, the insurance sector has witnessed a significant disparity in the preparation and presentation of financial reports across different jurisdictions, resulting in a clear disparity in the accuracy and integrity of financial performance indicators. This disparity is linked to the adequacy and efficiency of financial solvency and the quality and reliability of profitability rates. This phenomenon is due to the absence of unified accounting principles, foundations and policies that ensure the correct accounting treatments for insurance contracts (Costa et al., 2022). Although Iraq applies a unified accounting system for banks and insurance companies, and despite the fact that financial reports must follow high quality standards, financial reports are still below the required level (Yusrina et al., 2017). On the other hand, the increased need for financial reports, coupled with insufficient funds, has shifted the attention of actuaries to provide accurate estimates of claims costs and reserves (Mahuhu et al., 2023). The interest in the quality of reliable financial reports is of great importance due to its impact on management performance in government institutions, as high-quality financial reports are correlated with integrity in companies, as reliable financial reports of good quality can increase information transparency for users of financial information (Pangaribuan et al., 2023). Given the critical role of insurance companies worldwide, developing accounting standards for their financial reports is essential to enhance corporate governance. This need has become more important, especially with the implementation of International Financial Reporting Standard 17 (IFRS 17) on insurance contracts, which was included in the Statement of Financial Accounting Standards (PSAK 74) (Sibarani et al., 2024). The implementation of these standards has a positive impact on enhancing the reliability and content of financial reports. This improvement ensures that reports help in evaluating financial performance and making investment decisions (Al-Enezi & Hussein, 2022).

In this work, actuarial science and artificial intelligence are explored in order to improve the quality and usefulness of financial reporting. It also discusses an area of concern by reviewing the literature on artificial intelligence, the practice of accounting, and the quality of financial data. The work promotes using AI to enhance financial information disclosure's effectiveness, accuracy, and legal compliance. Additionally, it provides recommendations on how to leverage the benefits of adequately employing the technologies in question.

As such, the focus of this study on the challenges and possibilities of modernization in accounting adds to the ongoing qualitative contribution. Finally, this work significantly impacts the present knowledge base as it demonstrates that some parts of AI and actuarial sciences could reimagine accounting processes and improve the reliability and global concordance of financial reports.

2. Literature Review and Hypothesis Development:

2.1 Literature review:

This section reviews the relevant literature on the potential to improve the quality of financial reports through the application of more advanced actuarial calculations, artificial intelligence analysis, actuarial methods and the quality of financial reports.

(Al-Kadhy, 2023) focused on assessing the effectiveness of AI to improve the readability of financial statements of telecom and media companies operating in Egypt from 2020-2022. The results showed that AI enhances the reliability of the reported accounts and improves disclosure; thus, there is a significant relationship between the adoption of AI and transparency. Furthermore, the analysis revealed significant differences at the Company level and provided recommendations for the overall expansion of artificial intelligence utilization, development of appropriate employee training, and enhanced R&D investment.

(Samah & El-Meihey, 2023) investigate the impact of applying IFRS 17 on accounting measurement and disclosure, aiming to improve the quality of financial reports for Jordanian insurance companies, while ensuring compliance with IFRS 4. The study reviewed previous research, linked theory to practice, and collected data through a questionnaire. The study found a need for further research to address challenges like current laws, qualifications of report preparers, and the role of auditors in enhancing report quality.

(Tebaibia Salima, 2014) explored the financial structure of Algerian insurance companies and the role of international financial reporting standards (IFRS) in enhancing performance and decision-making. The research combined theoretical analysis with field studies, including interviews and questionnaires. The results showed that financial reporting standards enhance the clarity and comparability of financial reports. Furthermore, employees expressed a strong interest in deepening their understanding of these standards, with 82% of experienced employees (those with over five years of experience) demonstrating familiarity with IFRS. This familiarity facilitated the adoption of the standards and contributed to the sector's growth and development.

Similarly, (Khaldia, 2015) also aimed to enhance the insurance culture in Algeria, especially life insurance, mortality analysis, and the role of insurance. A field study was conducted on 122 employees in 5 insurance companies in Algeria using a questionnaire and data analysis S.S.P.S. Mortality tables were used to predict risks and determine the reserve balance. The results confirmed the importance of actuarial studies and mathematical tools such as life tables to ensure financial balance and continuity of insurance services.

(Chang, 2024) indicated that insurance companies' investments in technology positively affect performance, especially in the long term, which enhances efficiency and helps meet the challenges of the modern industry. The study recommended cautiously increasing investment in insurance and information technology while recognizing their long-term impact. The study was considered an essential step in understanding the insurance sector's performance, stressing the need for more research to clarify the relationship between these investments and company performance.

(Alcaide & Gonçalves, 2023) applies machine learning techniques such as Extreme Gradient Boosting and C5.0 to enhance the accuracy of predicting life insurance cancellation rates. The study showed the forecasting power of these techniques on cancellation rates and identified which key factors contributed to producing these data by analyzing survey data that included customer details and historical cancellation patterns. It is suggested that research be broadened to cover bigger and more diverse datasets and be focused on applications useful to improving risk management in the insurance industry.

(Szepesváry, 2022) examined advancements in the insurance industry, particularly the relationship between insurance and mathematics. The study focused on modeling cash flows and customer behavior in life insurance and the challenges of calculating non-life insurance premiums using Monte Carlo simulations and machine learning algorithms. It concluded that technology and quantitative methods enhance insurance modeling and pricing, improve data analysis and risk assessment, and ultimately increase the efficiency of the insurance sector.

(Kiermayer, 2022) investigated how machine learning and deep learning can boost the efficiency of the insurance sector and reduce costs. The study emphasized the use of AI in accounting, with techniques like neural networks applied to tasks such as contract clustering, customer withdrawal estimation, and Markov chain reconstruction. The findings showed that neural networks outperformed traditional algorithms, such as K-means and GLM, in modeling accuracy and handling rare events. The study concluded that AI significantly contributes to industry development and efficiency improvement.

Similarly, (Gentner et al., 2018) suggested that machine learning algorithms play a huge role and that AI can improve accounting, decision-making, and other processes by allowing fast and accurate data analysis. It was demonstrated that AI could provide strategic insights that enable organizations to increase their performance and achieve their goals more effectively; AI is another accounting and data-handling tool.

On the other hand, (Odoh et al., 2018) indicated that AI has positive effects on accounting, such as high accuracy, less time, better reporting, and less paper use, consequently enhancing efficiency and flexibility. The study also mentioned professional anxiety, with a 2015 Oxford University study showing that 95% of accountants were worried about job loss due to automation in data analysis and number crunching.

There is also a shared view of the study by (Davenport & Kirby, 2016) with the study by(Julia Kokina & Stephen Kozlowski, 2016) that accounting is a field that is likely to be enhanced by technology rather than become fully automated in the next two decades. Their claim was based on the fact that AI technologies can replace specific tasks rather than replace entire jobs. Therefore, job losses can be expected to be relatively slow in the short term and may be marginal rather than significant, as (Kokina & Davenport, 2017) reported in their study, it is common for senior accounting professionals in large firms to point to the need to continue with human accountants, both in light of the advances in AI technology and beyond. Based on these findings, the researchers also explained that the skills required for accountants may change in the future and that the demand for new accountants will decline in the coming years.

2.2 Hypothesis Development:

The research is based on a main hypothesis **"**The use of actuarial calculations supported by artificial intelligence significantly contributes to improving the quality of financial reports by enhancing estimation accuracy, increasing transparency, reducing human errors, and providing strategic analyses that facilitate more informed financial decisions**"**.

The main hypothesis of the research can be fulfilled by addressing a set of sub-hypotheses:

- Enhanced Estimation Accuracy:

AI-driven actuarial calculations improve the precision of financial estimates compared to traditional methods, resulting in more reliable financial reports.

- Improved Speed and Efficiency:

Smart actuarial calculations accelerate data collection and analysis processes, thereby reducing the time required for report preparation and increasing overall operational efficiency.

- Increased Transparency and Compliance:

The implementation of AI systems ensures adherence to professional accounting standards and enhances transparency in financial reporting, which boosts stakeholder confidence.

- Accurate Strategic Analysis:

AI techniques enable detailed analysis of financial trends and risk factors, providing management with strategic insights that support proactive and informed decision-making.

- Cost Reduction and Enhanced Audit Processes:

By minimizing human errors, AI-enhanced actuarial methods help lower operational costs and improve the efficiency of auditing and review processes.

3. Methodology:

3.1 Artificial Intelligence and the Transformation of Actuarial Science and Accounting into the Digital Age:

In actuarial science, traditional models and techniques are well established and still in use; however, there is a growing trend towards AI-based integration, which has been observed in the methods used in recent studies (Lozano-Murcia et al., 2023).

Moreover, actuaries' skills as risk management professionals extend their reach beyond liability and premium assessment, often in areas such as risk management, marketing, underwriting and product development (Balona, 2024). With increasing financial reporting requirements and ongoing solvency concerns, actuaries are faced with a greater need than ever to provide reliable estimates of claims, costs and reserves (Mahohoho et al., 2023). Given the increasing need for financial reporting and ongoing concerns about financial Sustainability (Baudry & Robert, 2017). We can now discover things that were difficult in the past, thanks to technology including artificial intelligence (Sadowski, 2024)

Accounting intersects with actuarial science in financial reporting, requiring actuaries to understand accounting standards thoroughly and generally accepted accounting principles to provide precise estimates of the financial impact of insurable events. This alignment reflects the evolving nature of accounting. The capitalist spirit of the twenty-first century has driven a shift toward an accounting approach grounded in future cash flow estimates calculated at actuarial rates. These estimates are influenced by various external factors, including economic, financial, and monetary policies, as well as inflation levels and their trends. Historically, accounting progressed from a static model in the eighteenth and nineteenth centuries to a dynamic model in the twentieth century. Today, the focus is increasingly on incorporating updated projections of future cash flows (Khalid, 2020).

AI has become increasingly prevalent across numerous industries, including accounting and financial reporting, and has experienced significant transformation as a result. Like many other sectors, accounting and financial reporting are not exempt from the influence of artificial intelligence. As technology continues to advance rapidly, professionals in these fields must stay informed about the critical issues associated with the application of artificial intelligence (Sreseli, 2023).

The accounting profession faces significant challenges in creating tools that adapt to the modern technological environment. This is where the concept of computerized or "digital" accounting comes into play. These technologies enhance accountants' capabilities, improve service quality, and support accounting strategies. Among these emerging advancements, artificial intelligence represents a pivotal technological shift. AI has transformed the traditional role of accountants and paved the way for the rise of digital accounting, particularly as smart Internet devices and AI technologies continue to advance (Al-Kadhy, 2023)

The findings add to the ongoing discussion on the integration of AI in arithmetic and offer valuable insights for practitioners, policymakers, and researchers. Additionally, AI algorithms analyze extensive financial data in real time, allowing organizations to derive meaningful insights into their financial performance.

Integrating AI into financial accounting and reporting brings numerous advantages but also introduces notable challenges that require careful attention. Ethical concerns emerge when AI systems unintentionally incorporate discriminatory biases into their algorithms, potentially influencing decision-making processes. Additionally, as organizations increasingly adopt AI for accounting tasks, the need for professionals skilled in AI technologies and accounting principles is rapidly expanding (Sreseli, 2023). This review examines the opportunities, benefits, and challenges associated with using AI in actuarial computations and financial reporting while addressing key ethical and technical issues related to its implementation in financial accounting.

It is essential to conduct studies that examine how the application of smart technology represented by artificial intelligence is used and affected in the development of actuarial calculations and its role in improving the quality of financial reports, as the results can be benefited from.

3.2 The importance of financial reporting and understanding of the accounting frameworks of actuaries in valuing claims and financial reserves:

Actuaries evaluate the financial consequences of insurable events, requiring a comprehensive understanding of the accounting standards that govern the reporting of these impacts

Accounting plays a crucial role for actuaries, extending beyond calculating reserves for insurance companies to include a variety of other key functions, as noted by ((Odomirok et al., 2014) These functions include:

- Collaborating with regulators to oversee the financial health of insurance companies.
- Pricing and designing insurance products while ensuring appropriate profit margins.
- Determining the capital requirements necessary to manage the risks faced by the insured.
- Assessing risk transfer in reinsurance contracts.
- Evaluating the adequacy of reserves for entities outside the insurance sector, such as organizations managing self-insurance or retaining portions of property and liability insurance.
- Preparing tax filings.
- Analyzing and assessing insurance companies in the context of mergers and acquisitions.

The above points emphasize that the results of actuarial work can vary significantly depending on the accounting framework employed. Consequently, it is essential for actuaries across different domains to have a solid understanding of various accounting frameworks and financial reporting systems. There are two main reasons why solvency and balance sheets are relevant to the actuary: (Odomirok et al., 2014). First, actuaries traditionally bear some responsibility for the Loss Adjustment Reserves and Expenses (LAE), which constitute the majority of liabilities (property insurance, accident insurance), and actuaries can be directly involved in identifying reserves or assessing their reasonableness, highlighting liabilities for losses and adjustments on the Liabilities, Surpluses and Other Funds page of the annual statement.

Second, actuaries often play a role in determining or evaluating the capital that an insurance company must have to support the risks it is exposed to during the course of its business, based on the actuary's understanding of the risk-based capital framework (RBC) and the calculation of the capital required to support operations. Actuaries can also assess surplus requirements based on other economic fundamentals, which requires them to be familiar with the rules of assets and liabilities on the balance sheet and understand the risk characteristics associated with each component.

There are several important guidelines for actuaries in issuing the Statement of Actuarial Opinion (SAO). Each actuary must read and understand the latest guidelines related to issuing an actuarial opinion statement. This relates to a document issued by the actuary to provide his opinion on a particular company's financial or insurance matters. This opinion includes an assessment of the company's obligations, risk tolerance, and compliance with legal regulations and requirements.

As well as it's there may be precise guidance to the actuary on how to draft and issue this statement of actuarial opinion, including the criteria to be followed and the information to include, and it depends on the legal and regulatory context and local requirements (Odomirok et al., 2014)

- Qualification Criteria: Clarified by the American Academy of Actuaries (AAA).
- SAO-specific Instructions: The SAO-specific instructions provided by the National Association of Insurance Commissioners (NAIC) should be reviewed.
- AAA Committee Practice Note (COPLFR): The AAA Committee Practice Note on Ownership and Liabilities Financial Reporting, particularly COPLFR, relating to property and loss insurance, should be reviewed.
- Regulatory Guidelines for: NAIC Regulatory matters should be taken into account at NAIC, including property and injury regulatory guidelines.
- Actuarial Practice Standards:(ASOP) Actuarial Practice Standards, such as ASOP Nos. 20, 23, 36, 41 and 43, should be reviewed to ensure that the submission is in accordance with the specified standards.
- State Laws: Actuaries are required to follow the laws of the state, particularly with regard to reserve requirements and SAO requirements, the SAO should be clearly organized into important sections including: identification, scope of opinion, and relevant comments, and all sections must be clearly listed and defined within SAO.

The researchers believe that actuaries' understanding of accounting rules and financial legislation helps them perform their functions efficiently and effectively and contributes to achieving financial and insurance stability for companies and institutions in general and insurance companies in particular, as it is important to understand the accounting rules and the diversity of tasks performed by actuaries in the field of insurance, as well as that there is a need to master the various accounting frameworks by actuaries to ensure that tasks are performed efficiently and effectively.

In this context, the sources of career guidance will be discussed, actuaries should consider when using machine learning and deep learning models:

Recently, the Institute and College of Actuaries issued (IfoA) Warning on "Development and Use of AI Technologies by actuaries" ،This document specifically covers areas related to the applications of Artificial Intelligence and Machine Learning Models ،Among the aspects that require The following: (Harris et al., 2024)

- The need to use models "in an ethical and transparent manner
- Ensure that the results of any AI-driven business do not lead to inappropriate consumer outcomes, such as unfair pricing or limited access to necessary financial services products.
- Ensure that the use of complex modeling techniques does not inadvertently violate any existing regulatory requirements, particularly with regard to protected properties.

- Explain assumptions, methods and outcomes, risks and limitations associated with data and models.
- Actuaries were particularly alerted to potential indirect discrimination problems caused by the use of deep learning models.

The basic professional requirements for actuarial deep learning models can be summarized in Table 1.

Table 1: Basic Professional Requirements for Actuarial Deep Learning Models

Subject	Professional Related Source
Application of modern knowledge	Code of Actuaries, ASSA Code of Conduct
Professional competence	Code of Actuaries, ASSA Code of Conduct
Understanding the model	TAS 100 P5.1, TAS100 Steering Model APN 901 APN 106/403
Relevance for purpose in terms of privileged relationships	TAS100, APN 901
Variability and productivity	TAS 100 Directive Model APN 901
Quantitative uncertainty	APN 901
Avoid bias (automatic standards, general balance)	TAS 100, P5.3
Bias and discrimination	Principle 2 of the Code of Actuaries, Code of Conduct, TAS 100 P 5.3, Directive Model TAS 100, IfoA Hazard Scale

Source: (Harris et al., 2024). https://doi.org/10.22624/aims/humanities/v11n1p4.

3.3 The Role of Artificial Intelligence in Improving Accounting Analytics and Financial Process Efficiency: Enhancing Transparency through Technology:

The use of information and technologies has become indispensable as institutions have attempted to integrate modern technology tools into their activities, prompting accounting to adopt new methods after relying on manual processes.

Organizations are aware of the growing need to use technological applications in the field of accounting and have responded to this shift relatively, and this response is expected to increase in the future, especially with regard to the use of artificial intelligence applications that represent the latest modern computing technologies, the technology policy in the field of insurance has long been based on collecting statistics about the population and using it to predict averages and probabilities. Insurers had difficulty analyzing individuals' behavior, due to the limited availability of data sources, especially for small-scale forecasts and real-time interactions, and the tools available to them were limited and inefficient enough. But today, with the advancement of insurance technologies and shifts in digital technology, insurance companies are equipped with more effective and visible tools, thanks to digital technologies such as connected devices and artificial intelligence analysis, which enable them to better assess individuals, manage risk more accurately, effectively prevent losses, and get more value.

These companies can now talk to customers with more clarity and confidence, and they can predict that the number of people they will sign up with based on their profile information will increase. Some individuals' risks are likely to increase over the coverage period but may decrease in cases of especially. In addition, smart devices and additional data made available to businesses could be a serious innovation as markets and industry applications expand; therefore, insurance companies must be cautious and aware of the new changes in this sector (Sadowski, 2024).

3.3.1Role of AI in improving the accuracy of accounting analytics and the efficiency of operations:

The importance of using artificial intelligence is embodied in improving the accuracy of analytics and the speed of calculations, which enhances efficiency in accounting work and supports innovation and digital transformation because these technologies are expected to improve transparency and accurate accounting reporting and reduce the cost of obtaining information and detecting errors in financial reports.

(Ding et al., 2020) highlighted that personal management plays a significant role in financial information and is becoming increasingly frequent and influential, largely due to the growth of fair value accounting promoted by standard-setters.

The impact of errors in administrative judgment, whether intentional or unintentional, on the quality of financial information is not entirely understood but is likely substantial. Therefore, improving the accuracy and dependability of accounting estimates is crucial for enhancing the relevance and utility of financial information.

Machine learning-generated accounting estimates may be more effective than those created by management, as archival data used for training can be processed systematically and consistently. However, managers can incorporate future-oriented information, such as inflation forecasts or economic conditions, which machines cannot. Thus, determining whether machines surpass humans in producing accounting estimates requires empirical investigation.

Studies analyzing a wide range of loss estimates for insurance companies (e.g., future claims payments) and their subsequent adjustments have found machine learning estimates to be more accurate than managers' estimates used in financial reports. These findings are both surprising and promising, especially given the pressing need for improved accounting estimates. However, the generalizability of these results remains uncertain at this early stage of applying machine learning to accounting figures. Further research is essential to explore and extend machine learning's application to other types of accounting estimates, such as bad debt provisions and escrow reserves.

Machine learning-generated accounting estimates hold several potential practical applications. They can serve as benchmarks for comparing management's estimates, prompting re-evaluation when significant deviations occur. Alternatively, machine learning could be employed to produce management estimates directly, improving the reliability and consistency of financial reporting by reducing manipulation. In all cases, continued research is critical to uncovering the full potential of machine learning—already rapidly advancing in other domains—for enhancing financial information (Ding et al., 2020). The above-mentioned clearly shows that the road to the future requires accountants to be ready to adopt artificial intelligence and digital technology, to contribute to the development of their field and to improve their performance in the face of the increasing challenges in the modern business environment (Al-Kadhy, 2023).

The researchers believe that the importance of using artificial intelligence in improving the accuracy of analytics and the speed of calculations is embodied in enhancing the efficiency of accounting work and supporting innovation and digital transformation, as artificial intelligence plays a vital role in improving the quality of financial reports and increasing their transparency, in addition to reducing the costs of obtaining information and detecting errors in financial reports.

Relying on AI techniques can contribute to improving the quality of financial reports by improving the accuracy of accounting analyses and providing accurate settings for financial reports. Accountants can generate accurate financial reports in less time than was possible before, boosting efficiency and reducing waiting times.

Moreover, AI techniques can analyze data in advanced ways to discover trends and vital information that can help companies make informed strategic decisions, through the use of machine learning techniques, accountants can analyze financial data more deeply to detect patterns and trends that may not be directly obvious. In addition, artificial intelligence technologies can provide more transparency in financial reports by analyzing data comprehensively and accurately, which helps in providing a clearer picture of the company's financial situation, and it is worth noting that despite all the advantages, AI technologies are not ideal and may face some challenges such as data security and privacy, but the benefits they offer in improving the quality of financial reporting and enhancing the efficiency of accounting work certainly justify investing efforts and resources in this domain.

3.3.2. The relationship between the application of AI technology and the transparency of financial reporting:

Positive studies of the application of AI technology have shown a remarkable impact on enhancing the transparency of financial reports because previous studies (Al-Kadhy, 2023) have indicated that there is multiple factors affecting the transparency of financial reports, including:

- AI works to achieve better resource efficiency and detection transparently.
- AI contributes to providing accurate and objective assurances to interested parties regarding the use of funds.
- AI helps verify the transparency of financial records and ensure that they are not exploited in profit management.
- Artificial intelligence increases the level of confidence in the information provided in financial reports.
- AI helps build more effective relationships with internal and external parties.
- AI helps verify that organizations are adopting modern principles such as continuous improvement, digital sustainability, and business innovation.

Although the application of AI technology in accounting and financial reporting raises divergent opinions, many welcome the opportunity to improve the efficiency and accuracy of accounting and reporting processes, which enhances confidence in the financial information provided. AI technology offers more benefits than challenges, contributes to enhancing the transparency of financial reports, achieving accurate and objective assurances for stakeholders, and achieving an increase in effectiveness and productivity, however, the financial sector must deal with this technology, and adapt to the challenges and changes that may occur with its adoption.

3.3.3 . Current AI applications in accounting and financial reporting:

AI has transformed many industries, and accounting and financial reporting. The integration of AI technologies in these areas has made significant advances, simplifying processes, improving accuracy, and improving decision-making capabilities.

Diverse applications AI Current in Accounting and Financial Reporting into a wide range of tasks and processes, providing significant benefits in efficiency, accuracy and strategic insights ، Here are several applications as explained in a study by (Sreseli, 2023):

- Data Entry and Automated Reconciliation: AI systems can extract financial information from sources like invoices, receipts, and statements, automatically populating accounting software. This reduces manual effort, minimizes errors, and saves time while improving accuracy.
- Financial Data Analysis: AI can conduct advanced analytics and detect patterns in extensive financial data, helping accountants uncover trends, inconsistencies, and correlations. These insights support forecasting, budgeting, and informed decision-making.
- Fraud Detection and Risk Assessment: By analyzing financial transactions, supplier information, and related data, AI algorithms can identify patterns indicative of fraudulent activities. They flag suspicious transactions or deviations from typical behavior, aiding in the prevention and early detection of financial fraud.

- Financial Statement Preparation and Analysis: AI streamlines financial statement preparation by automating data collection, classification, and reporting. It ensures compliance with accounting standards, enhances accuracy, and reduces the time required for reporting. Additionally, AI performs in-depth analyses, offering insights into financial performance indicators such as profitability, liquidity, and other key metrics.
- Risk Management and Auditing: AI-based tools evaluate financial risks by examining historical data, market trends, and risk factors. They support auditors in identifying risk-prone areas, conducting assessments, and streamlining the audit process. Furthermore, AI enhances internal control systems, improving the effectiveness of risk management practices.
- Revolutionizing Accounting and Financial Reporting: AI can transform accounting and financial reporting by automating repetitive tasks, enhancing accuracy, optimizing decision-making, and boosting efficiency through technologies like machine learning, natural language processing, and robotic process automation.

3.3.4Challenges of applying AI technology in accounting and financial reporting:

Data quality and accessibility form the basis of AI systems, as the exact decision depends on high-quality data ‹However, many challenges may arise in this context (Sreseli, 2023)

- Unintentional biases may be reflected in the data used in the training of smart models, and this issue raises ethical concerns, especially in sensitive areas such as finance and accounting; hence, achieving justice and reducing bias in artificial intelligence models and decision-making processes comes as a major challenge that must be addressed.
- In terms of interpretation and transparency, smart algorithms are often black boxes, making it difficult to understand how they generate decisions, and this lack of interpretation raises additional concerns, especially in the financial field where transparency is vital, so the main challenge is to develop ways to make AI models more transparent and interpretable.
- As for ethical considerations, the use of AI in accounting and finance raises several ethical issues, such as respecting data privacy, influencing recruitment and responsibility for the decisions it makes, and dealing with these challenges effectively to ensure that AI is used responsibly and ethically.
- With regard to skills gaps and workforce transformation, the integration of AI in accounting and financial reporting requires raising workforce skills and adapting them to new roles, and these challenges are major challenges that must be addressed to ensure the successful implementation of AI systems.
- As for trust and adoption, building trust in AI technologies among stakeholders is vital, and concerns about job losses, data privacy, and bias must be addressed to ensure AI adoption and acceptance in accounting and financial reporting.
- As for technical constraints, AI systems face technical constraints related to understanding context, lack of common sense, and vulnerability to malicious attacks, and these challenges must be overcome to ensure the reliability and accuracy of AI applications.
- Finally, cost and return on investment must be considered. Implementing AI solutions may involve significant costs, and organizations must measure ROI and show the value of AI implementation.

Organizations need to develop strategies to mitigate risks, ensure the ethical and reliable use of AI, and address key issues and challenges to take full advantage of the benefits of AI in accounting and financial reporting.

The researchers believe that improving the quality of financial reporting is significantly influenced by factors related to understandable machine learning models and bias management; for example, improving and documenting models used in financial analysis processes contributes to improving the accuracy of analytics and providing more accurate forecasts.

Understanding and governance of models contributes to increased transparency and credibility in financial reporting, enhancing investor and stakeholder confidence.

On the other hand, model risk management plays a vital role in ensuring that models are used correctly and reliably, and reducing the potential risks associated with them, thus, improving data quality and combating bias in data collection contribute to improving the quality of the results and expectations provided by the models, so by using understandable models effectively and reliably, ensuring improved data quality and managing biases, accurate and reliable financial analyses can be achieved, Thus, companies and institutions can rely on these analyses to make financial and strategic decisions with confidence and certainty, which contributes to improving the quality of financial reports in general and enhancing their position in the financial market.

3.4 The importance and role of actuarial accounting in enhancing the quality of accounting information and decision-making in insurance companies:

In the modern era, actuarial accounting is one of the basic tools that enhance the accuracy and reliability of accounting information in insurance companies, and the complex and constantly changing financial environment requires the use of advanced techniques and accurate analytical methods to ensure informed and sustainable decisions, actuarial accounting contributes significantly to achieving this goal by providing in-depth analyses and financial projections based on advanced statistical and mathematical models, as These analyses help identify potential financial risks and assess future liabilities, enabling companies to develop effective strategies and manage their resources efficiently In addition, actuarial accounting contributes to improving the quality of accounting information provided to shareholders and stakeholders, enhancing transparency and confidence in companies' financial reports.

3.4.1 The importance of actuarial accounting in enhancing the quality of accounting information for insurance companies:

The importance of actuarial accounting is evident in light of the increasing investment risks and uncertainties surrounding the investment environment, as the financial markets are witnessing an unprecedented decline due to investors' fears of potential risks.

The insurance sector is an essential element in the financial system, as it provides savers and investors with alternatives that ensure the stability of capital and promote its growth, these conditions require the presence of experts and specialists in the analysis of expected and future risks, and they are carefully trained in actuarial accounting sciences, as they are an essential part of the business field, as these experts apply mathematical and statistical methods to assess and manage risks in the field of insurance and pensions, Actuarial accounting contributes to the process of making and enhancing financial decisions, by estimating the financial effects of uncertain future events, the fields of actuarial science include a number of interrelated groups, such as probability, finance, economics and accounting, which benefit decision-makers in insurance companies to protect their financial institution and avoid unexpected risks, as well as that actuarial accounting provides support and assistive technologies to specialists in insurance companies, and enhances the feasibility and continuity of those companies, As well as reducing future financial risks and ensuring the highest quality of accounting information.

The importance of actuarial accounting in insurance companies depends on several factors that contribute to enhancing the quality of accounting information and improving the performance of systems and institutions. This is due to the return on investment on subscriptions, increasing the ability of stakeholders to understand and evaluate the performance of systems or institutions, and supporting and enhancing their ability to face challenges and competition.

Insurance companies in many countries, especially developed countries, rely on actuarial accounting to achieve several long-term goals (Abdi, 2024), among which are:

- Learn about the demographic structure of insurance companies by understanding the number of subscribers and their characteristics.
- Estimation of the insurance company's resources derived from contributions and investment returns.
- Estimate expenses related to insurance companies' funds, including benefits, insurance and financial burdens.
- Maintain a desirable level of financial reserves of the insurance company's fund.
- Enhancing the company's competitive position, retaining its existing shareholders, and attracting new shareholders.

The researchers believe: From the above, the importance of applying actuarial accounting in achieving financial sustainability and competitiveness for insurance companies and improving the level of confidence of the public and investors in the performance of these companies in the market, and it can be said that investing in the development and strengthening of actuarial accounting is a vital investment for insurance companies.

3.4.2 . The Role of Actuarial Accounting in Improving the Quality of Accounting Information and Decision-Making in Organization stop Model:

The use of actuarial accounting has a positively influences on the quality of accounting information and the level of quality of decisions. The lack of quality of information may negatively affect the decision-making process. For example, any error in the database can lead to incorrect decisions due to a lack of understanding of actuarial values, which involves the company's profitability and customer satisfaction. Researchers have supported this opinion by suggesting that errors stored in the organization's database could lead to bad decisions.

Inaccurate and incomplete data may impact the competitive success of the organization. Decision-making is the starting point for all activities, relationships and interactions with the external environment, as stopping decision-making within the organization can lead to obstruction of business, and the importance and seriousness of decisions increase with the increasing size of the organization and the diversity of its activities and communication with the public.

The decision-making process is directly related to management functions, such as planning, organization, direction and control, which occur at every level of activity in the organization. The roles of expert accountants include analyzing financial statements, providing financial advice, and providing accurate and transparent financial reports to help management make the right decisions. The role of the actuary is one of the main roles in insurance companies, as the actuary provides special statistical analyses and deals with administrative, technical and financial issues, as well as provides notes and advice on accepting or rejecting insurance applications and participates in the work of control and supervision, the actuary can be considered the main human resource in the business of insurance companies, as his work is mainly focused on the field of life insurance, which is the widest and most diverse field of expert work Actuaries. An actuary examines cases from multiple perspectives, analyzes potential risks, categorizes age groups of insurance beneficiaries, and oversees various programs. These include estimating liabilities, pricing insurance products, managing financial instruments, designing reinsurance programs, managing strategic assets, and more.

The role of the health actuary is related to the analysis of health risk situations, adjustment of revenue risks resulting from them, analysis of compensation of medical providers, study of the impact of health care, prevention and other health-related topics.

The actuary's role reflects three main points in the insurance field as cited by (Abdi, 2024)

- Insurance rates are commensurate with the risks covered and get a favorable profit margin.
- Maintain technical reserves as an indicator of portfolio size and calculate the amounts expected to be paid on maturity dates.

- Non-discrimination between documents in pricing, management and distribution of profits.

From the above, it is clear that the role of the actuary plays a vital role in organizing and managing insurance operations and maintaining the stability of insurance institutions, and therefore, the reflection of the role of the actuary in improving the quality of financial reports is reflected in several aspects:

- The actuary contributes to providing accurate analysis of the financial risks facing insurance institutions, which helps provide data-driven guidance to company management.
- The actuary contributes to the development of financial risk management procedures as they become more effective and effective in achieving the company's objectives and balancing risks and expected returns.
- The actuary promotes transparency and credibility in financial reporting by providing objective and transparent analyses of financial information and related risks. Thus, the institution's reputation improves, and its position in the financial market increases, enhancing its position and attracting more investors and potential customers.

3:5. The use of artificial intelligence in the development of actuarial accounts and its role in improving the quality of financial reporting:

The use of artificial intelligence in the development of actuarial calculations is a revolutionary step that enhances the accuracy of financial analysis and increases the reliability of forecasts related to risks and obligations of insurance companies; thus, artificial intelligence contributes to improving the quality of financial reports by providing more accurate predictive models, which enhances transparency and trust between shareholders and stakeholders.

3:5:1. The use of AI in the development of actuarial accounts and its role in improving the quality of financial reports from the point of view of professional standards and actuarial guidelines:

The researchers believe that professional standards and actuarial guidelines are essential to ensure the quality of actuarial work and its compliance with specific standards, as actuaries rely on these standards and guidelines to develop financial accounts and improve the quality of financial reports using modern technology such as artificial intelligence and deep learning.

The application of professional standards in actuarial and how to achieve them through professional regulation and approved guidance is of great importance as they provide an important context for understanding how the application of professional standards can contribute to improving the quality of financial reporting and its role in developing actuarial practices.

In other words, it indicates that adherence to professional standards ensures the reliability of actuarial work and its correct and effective execution, and this directly affects the quality of financial reporting.

Moreover, explained how to apply professional standards in actuarial work, including rules and guidelines on professional conduct and general practice standards.

Although it did not directly discuss the use of artificial intelligence, understanding the professional and legal context of the actuarial field paves the way for modern technologies, such as artificial intelligence to analyze financial statements and improve the quality of financial reports. In fact, AI can be a valuable tool in improving the accuracy of financial analysis, identifying biases and potential risks in data, enhancing integrity and transparency in financial reporting, and enhancing the role of actuaries in ensuring the quality of these reports.

In this context, actuarial standards and guidelines included general requirements that include data quality assurance, prudence, peer auditing, documentation and communication, which are relatively familiar to actuaries and contribute to improving the quality of business and developing financial accounts.

On the other hand, specific criteria require more attention when using intelligence. Artificial and deep learning in actuarial work ‹Actuaries are tasked with ensuring that Private Deep models of learning are suitable for their intended purpose and free from large biases, which may stem from training data or a specific algorithm.

The guidance also urges the prevention of unfair consumption outcomes and violations of regulations and stresses the need to explain and expose assumptions, methods, outcomes, risks and limitations associated with data and models.

These guidelines, therefore, require understanding and transparency in the application of complex models such as deep learning and call for ethical use and addressing biases, including biases related to protected characteristics or lack of data, with the aim of enhancing quality and integrity in financial reporting and ensuring the application of AI responsibly and effectively in actuarial science.

3:5:2 The role of smart actuarial calculations in improving the quality of financial reporting:

Smart actuarial calculations represent an innovative application of artificial intelligence technology in the field of accounting and finance. Artificial intelligence is an important part in developing and improving accounting processes and producing high-quality financial reports.

It is believed that there are some ways in which smart actuarial calculations can contribute to improving the quality of financial reporting:

- Increase information accuracy (automatic accounting): Smart actuarial calculations can automatically process routine accounting processes, reducing human input error and increasing data accuracy.
- Accelerate reporting processes in real-time: Smart actuarial calculations use AI algorithms to collect and analyze data faster, helping to produce faster and more accurate reports.
- Ensure compliance and transparency: Smart actuarial accounts can follow legal changes and compliance controls, contributing to ensuring financial reporting meets the requirements of legal and accounting standards.
- Provide strategic analytics and predict financial trends: AI is used to analyze historical data and make predictions of future financial performance, providing businesses with strategic insights to make decisions.
- Reduce costs, improve efficiency and improve audits: Smart actuarial calculations can comprehensively analyze data and provide accurate details, simplifying audits and reducing costs.

AI is a valuable tool that helps accountants perform their duties rather than replacing their expertise. By automating routine tasks and streamlining operations, AI allows accountants to shift their focus to high-value activities, such as strategic planning and providing in-depth analyses. One area where artificial intelligence has demonstrated significant potential is accounting and financial reporting. Appling advanced algorithms and machine learning, artificial intelligence offers a promising solution to automate and simplify accounting processes, enhance data analysis, and improve the accuracy and timeliness of financial reports.

The researchers believe that smart actuarial calculations refer to the use of artificial intelligence and machine learning techniques in complex calculations and data analysis more efficiently and accurately, and these calculations aim to improve performance and make decisions faster and more accurately, smart actuarial calculations can be used in a variety of areas. Therefore, the researchers can say that actuarial calculations using artificial intelligence (smart actuarial calculations) contribute to improving the accuracy and speed of calculating life insurance premiums and risk analysis, which ultimately leads to improving the quality of financial reports and increasing the reliability of financial information provided to shareholders, investors and external parties.

Researchers also highlight a distinction between traditional actuarial calculations and those enhanced by artificial intelligence (smart actuarial calculations). This difference impacts the calculation of life insurance premiums and improves the quality of financial reporting, as illustrated in Table (2).

Table (2): The difference between traditional actuarial calculations and actuarial calculations using artificial intelligence (smart actuarial calculations)

Item	Smart Actuarial Calculations	Traditional actuarial calculations
Data collection and analysis	It collects and analyses massive data from multiple sources in an automated manner, increasing the accuracy of calculation and data analysis.	It relies on specific, manually entered data, which may be limited and inaccurate.
Accuracy of estimates	Advanced techniques are used to analyze data and improve the accuracy of estimates and the accuracy of calculating insurance premiums.	They may be inaccurate due to human errors and reliance on limited information.
Process speed	Calculations and analysis are done at high speed and automatically, saving time and effort.	It may take a long time to perform calculations and analyses manually.
Improving the quality of financial reporting	AI-powered actuarial calculations improve the quality of financial reporting by providing accurate and reliable estimates of insurance premiums and future claims.	You may not be able to provide accurate estimates of insurance premiums and future claims.
Trend and risk analysis	Relying on artificial intelligence, companies can analyze trends, better identify financial risks, and build strategies to deal with them, enhancing the quality of financial reporting and financial planning.	They may be limited in their ability to analyze trends and effectively identify financial risks.

4. Conclusions:

- There is importance for the financial reports of the actuary as actuaries estimate the financial impact of insurable events, and therefore, they need to understand the accounting rules under which this financial impact is reported, as actuaries' understanding of accounting rules and financial legislation helps them perform their jobs efficiently and effectively, and contributes to achieving financial and insurance stability for companies and institutions in general and insurance companies in particular, as there is importance To understand the accounting rules and the diversity of tasks performed by actuaries in the field of insurance.
- Artificial intelligence has transformed many industries, and accounting and financial reporting is no exception. The integration of artificial intelligence in accounting and financial reporting has made great progress by completing repetitive tasks accurately and quickly, improving decision-making capabilities, artificial intelligence is an auxiliary tool for accountants, not a substitute for their expertise, as it enables them to direct their focus towards high-value-added activities, such

as strategic planning and deep analysis, so the use of technologies such as machine learning, natural language processing and automated process automation has contributed to increasing efficiency and accuracy in this field, making artificial intelligence one of the main tools to improve accounting performance and financial reporting.

- Relying on artificial intelligence techniques can contribute to improving the quality of financial reports by increasing the precision of accounting analyses and providing accurate settings for financial reports, thanks to the ability of artificial intelligence to process huge amounts of data quickly, so accountants can generate accurate financial reports in less time than was possible before, which enhances efficiency and reduces waiting times. Moreover, artificial intelligence techniques can Analyze data with advanced methods to discover trends and vital information that can help companies make informed strategic decisions.
- Professional standards and actuarial guidelines are essential to ensure the quality of actuarial work and its compliance with specific standards, and actuaries rely on these standards and guidelines to develop financial accounts and improve the quality of financial reports using modern technology such as artificial intelligence and machine learning.
- Smart actuarial calculations represent an innovative application of artificial intelligence technology in the field of accounting and finance, as artificial intelligence is an important part of developing and improving accounting processes and producing high-quality financial reports. There is a difference between traditional actuarial calculations and actuarial calculations using artificial intelligence (smart actuarial calculations) and their impact on calculating life insurance premiums and thus their role in improving the quality of financial reports, as Actuarial calculations using artificial intelligence (smart actuarial calculations) contribute to improving the accuracy and speed of calculating life insurance premiums and risk analysis, which ultimately leads to improving the quality of financial reporting and increasing the reliability of financial information provided to shareholders, investors and third parties.

5. Recommendations:

- The need to conduct such research and similar to this research, which aims to determine how the application of smart technology represented by artificial intelligence is used and affected in the development of actuarial accounts and its role in improving the quality of financial reports, as the results can be used as a reference for future academic researchers who are interested in studying the use and impact of smart technology in the accounting fields.
- The accounting and auditing major must undergo a transformation process in order to reach the next level (interdisciplinary cooperation) that is a must, and it can be said that a hybrid accounting and auditing profession is expected to emerge and lead the professions in the future world, this means that the development and implementation of artificial intelligence in these fields will be a challenge that requires continuous attention and work.
- The need to adhere to professional standards to ensure the reliability of actuarial work and its correct and effective implementation, which would directly affect the quality of financial reporting, in addition to clarifying how professional standards are applied in actuarial work, including rules and guidelines related to professional conduct and standards of general practice.
- This research emphasizes the importance of adopting artificial intelligence techniques to develop actuarial accounts, as artificial intelligence can significantly enhance the accuracy and efficiency of these calculations, leading to improving the quality of financial reporting by providing accurate and comprehensive analysis, reducing costs, enhancing the ability to adapt to market and regulatory changes, and ensuring compliance with standards, which ultimately enhances transparency and accountability and increases investor and stakeholder confidence.

Authors Declaration:

Conflicts of Interest: None

-We Hereby Confirm That All The Figures and Tables In The Manuscript Are Mine and Ours. Besides, The Figures and Images, which are Not Mine, Have Been Permitted Republication and Attached to The Manuscript.

- Ethical Clearance: The Research Was Approved by The Local Ethical Committee in The University.

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