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Economies

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Suggested Citation: Al Maqtari, Faozi A. (2024) : The role of IT governance in the integration of AI in accounting and auditing operations, *Economies*, ISSN 2227-7099, MDPI, Basel, Vol. 12, Iss. 8, pp. 1-24,
<https://doi.org/10.3390/economies12080199>

This Version is available at:

<https://hdl.handle.net/10419/329125>

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Article

The Role of IT Governance in the Integration of AI in Accounting and Auditing Operations

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Abstract: IT governance is a framework that manages the efficient use of information technology within an organization, focusing on strategic alignment, risk management, resource management, performance measurement, compliance, and value delivery. This study investigates the role of IT governance in integrating artificial intelligence (AI) in accounting and auditing operations. Data were collected from 228 participants from Saudi Arabia using a combination of convenience sampling and snowball sampling methods. The collected data were then analyzed using structural equation modeling. Unexpectedly, the results demonstrate that AI, big data analytics, cloud computing, and deep learning technologies significantly enhance accounting and auditing functions' efficiency and decision-making capabilities, leading to improved financial reporting and audit processes. The results highlight that IT governance plays a crucial role in managing the complexities of AI integration, aligning business strategies with AI-enabled technologies, and facilitating these advancements. This research fills a gap in previous research and adds significantly to the academic literature by improving the understanding of integrating AI into accounting and auditing processes. It builds on existing theoretical frameworks by investigating the role of IT governance in promoting AI adoption. The findings provide valuable insights for accounting and auditing experts, IT specialists, and organizational leaders. The study provides practical insights on deploying AI-driven technology in organizations to enhance auditing procedures and financial reporting. In a societal context, it highlights the broader implications of AI on transparency, accountability, and trust in financial reporting. Finally, the study offers practitioners, policymakers, and scholars valuable insights on leveraging AI advancements to optimize accounting and auditing operations. It highlights IT governance as an essential tool for effectively integrating AI technologies in accounting and auditing operations. However, successful implementation encounters significant organizational challenges like organizational support, training, data sovereignty, and regulatory compliance.

Keywords: big data; cloud computing; deep learning; IT governance; auditing functions; accounting operations



Citation: Almaqtari, Faozi A. 2024. The Role of IT Governance in the Integration of AI in Accounting and Auditing Operations. *Economies* 12: 199. <https://doi.org/10.3390/economies12080199>

Academic Editor: Periklis Gogas

Received: 27 May 2024

Revised: 22 July 2024

Accepted: 23 July 2024

Published: 1 August 2024



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1. Introduction

Integrating emerging technologies has significantly advanced accounting operations, transforming these processes (Enholm et al. 2022; Han et al. 2023). New technology has significantly improved accounting operations, enhancing accuracy and efficiency (Shaffer et al. 2020; Yoon 2020). Automated routine tasks allow accountants to focus on strategic tasks like data entry, invoice processing, and payroll management (Kopalle et al. 2022; Vărzaru 2022; Wamba-Taguimdje et al. 2020). Machine learning and big data (BD) analytics algorithms can process large-scale financial data quickly, enabling better risk management, financial forecasting, and decision-making (Di Vaio et al. 2020; Salijeni et al. 2019; Schmitz and Leoni 2019; Vărzaru 2022). Similarly, cloud computing enables real-time reporting, while AI-driven audit tools improve audit quality by identifying irregularities and fraud (Faccia et al. 2019; Issa et al. 2016; Sledgianowski et al. 2017). Further, AI-powered software

can quickly identify inconsistencies and reconcile accounts while continuous monitoring reduces non-compliance risks and legal issues. AI algorithms can also provide individualized financial advice by analyzing a company's unique data and market circumstances, allowing companies to modify their financial plans to suit their specific needs (Cabrera-Sánchez et al. 2021; O'Leary 2009).

However, rapid technological advancements pose complex challenges for organizations in integrating AI with accounting and auditing functions. AI has the potential to transform accounting and auditing but faces challenges such as data quality and bias, which can lead to incorrect outcomes and poor decision-making (Brown-Liburd and Vasarhelyi 2015; Lee and Tajudeen 2020; Noor and Mansor 2019; Schmitz and Leoni 2019). Because some current systems may not be built to manage the needs of AI data, integrating AI with them can be difficult and expensive (Lee and Tajudeen 2020; Munoko et al. 2020; O'Leary 2009; Yoon 2020). Additionally, the accounting and auditing occupations may be experiencing a skills deficit in their workforce, which calls for upskilling and reskilling to comprehend AI discoveries and identify biases (Shaffer et al. 2020; Sutton et al. 2016). The growing interest in AI's potential to improve accounting and auditing techniques is mainly due to the need to understand how information technology governance (ITG) facilitates such interactions (Abdullah and Almaqtari 2024). Ineffective governance can hinder the potential benefits of AI technology, making it crucial for firms to optimize their processes (Wang 2022; Xia et al. 2022). A robust IT governance structure can help close the gap between AI adoption and transformation in accounting and auditing (Papagiannidis et al. 2023). This structure includes data governance, which creates explicit norms and procedures for data collection, storage, and access, ensuring data quality and reducing bias concerns (Arnaboldi et al. 2017). IT governance also sets standards for data formats and communication protocols, making it easier to integrate AI tools with current software (Abdullah and Almaqtari 2024).

Various studies indicate the essential role of IT governance in ensuring these technologies' ethical, secure, and efficient use (Bradley and Soule 2018; Erasmus and Marnewick 2021; Teixeira and Tavares-Lehmann 2022). IT governance establishes unified data governance policies to ensure data quality, security, and ethical use and defines ethical guidelines for deploying AI algorithms to maintain transparency, fairness, and accountability (Nedbal et al. 2011; Schmidt and Kolbe 2011; Molla et al. 2009). Effective IT governance is critical for leveraging AI while mitigating associated risks (Wang 2022; Xia et al. 2022). It provides a framework for informed technology investment decisions, regulatory compliance, and aligning technology strategies with business objectives (Bradley and Soule 2018; Teixeira and Tavares-Lehmann 2022; Yu et al. 2022).

This research explores the mediating effect of IT governance on the relationship between AI technologies and the transformation of accounting and auditing operations in some Saudi business organizations. Saudi Arabia is undergoing significant economic transformation under Vision 2030, aiming to diversify the economy and modernize sectors like finance and technology. The integration of AI in accounting and auditing presents unique challenges and opportunities. Cultural and institutional factors, as well as regional technological advancements, can affect the adoption and impact of AI. Studying AI's impact in Saudi Arabia can provide insights for other emerging economies. The findings can inform policymakers, practitioners, and academics, benefiting international readers with similar economic structures or development goals. Accordingly, the research questions raised in this regard are: What is the influence of AI on accounting and auditing operations, and what is the role of IT governance in this regard? These research questions become paramount to understanding the implications and opportunities presented by AI integration.

Accordingly, the present research aims to investigate the effect of technological advancements such as AI (big data analytics, deep learning, and cloud computing) on transforming several accounting and auditing functions. Further, the research aims to explore the role of IT governance in the relationship between AI and accounting and auditing operations. The current research provides a unique and novel contribution to the existing stock of knowledge and bridges an existing gap in prior studies. The research bridges an existing gap by exploring how these technologies reshape specific auditing and accounting practices within the country's unique regulatory and operational landscape. Several prior studies exist that investigate the effect of AI on auditing and accounting practices (Damerji and Salimi 2021; Kokina and Davenport 2017; Lee and Tajudeen 2020; Munoko et al. 2020; Shaffer et al. 2020; Sutton et al. 2016; Vărzaru 2022; Zhang et al. 2020). AI is more intelligent than traditional information systems, which can bridge the association between traditional accounting information systems and intelligent systems, leading to increased automation and optimization of information systems (Damerji and Salimi 2021). AI is revolutionizing accounting and auditing by automating repetitive tasks, providing deeper insights into financial and non-financial performance, and improving decision-making. AI systems can scan large datasets, detect anomalies, and increase audit quality. AI can automate data collection, extraction, and validation, allowing auditors to focus on higher-level judgment activities (Kokina and Davenport 2017).

However, the specific effect on auditing and accounting practices such as costing, financial planning, taxation, audit planning, audit process, and audit reporting still needs more exploration. Moreover, the study provides a novel contribution by exploring the mediating effect of IT governance on the relationship between AI and auditing and accounting practices. Despite the fact that there are some studies that investigate IT governance in several contexts (Cath 2018; Elazhary et al. 2022; Hardin-Ramanan et al. 2018; Kostka et al. 2020; Prakash and Ambedkar 2022; Simonsson et al. 2010), there are no studies that explore the role of IT governance in the relationship between AI and auditing and accounting practices, especially in the context of emerging countries.

The research contributes to the existing knowledge by enhancing IT governance knowledge in the context of new technologies and accounting operations. The research aligns with current theoretical frameworks like the Resource-Based View (RBV) (Wamba-Taguimdje et al. 2020) and the Technology–Organization–Environment (TOE) framework (Gomez 2018), providing a theoretical framework for understanding the interactions between developing technologies, IT governance, and accounting activities. The study employs sophisticated research methodologies, such as structural equation modeling (SEM), to investigate the intricate interactions between variables. It also provides research-based perspectives from Saudi Arabia, enhancing the generalization and application of the findings. The study provides practical guidance for practitioners and policymakers in Saudi Arabia on incorporating cutting-edge technologies into accounting processes. It offers recommendations for implementing governance mechanisms to maximize the advantages of AI and other technologies in accounting procedures. The findings could improve the effectiveness and capacity of accounting operations, leading to better risk management, financial reporting, and overall organizational success. The study supports Saudi Vision 2030, which promotes technical innovation and advancement in various industries, including accounting and finance. By promoting the adoption of emerging technology, the study contributes to achieving Vision 2030's goals and the nation's economic development.

The study structure starts with an introduction outlining the research objectives. A literature review follows this in Section 2, which establishes the theoretical foundations and hypotheses. Section 3 details the methodology and explains the research approach. Section 4 presents the results and analysis, while Section 5 discusses the implications of the empirical findings. Finally, Section 6 synthesizes the key insights and suggests directions for future research.

2. Literature Review and Hypotheses Development

2.1. The Saudi Context

The Saudi Vision 2030 emphasizes the potential of artificial intelligence for digital transformation and creative services. The government is implementing significant initiatives, but the extent to which Saudi enterprises are ready for this transformation needs more research investigation, considering factors affecting readiness and potential issues (Abdullah and Almaqtari 2024). Further, Saudi Arabia's National Transformation Program (NTP) aims to achieve the Saudi Vision 2030 by accelerating digital infrastructure projects in higher education institutions. The NTP has set national development objectives to advance AI research (Alotaibi and Alshehri 2023). Saudi Arabia has invested significantly in emerging technologies to drive economic growth and achieve the objectives outlined in Vision 2030 (Alanazi 2023; Khan et al. 2022). The Saudi Arabian government prioritizes cybersecurity and other AI tools, with AI projected to contribute to the country's GDP by 2030. Saudi Arabia is projected to generate up to \$135.2 billion in economic output by 2030, accounting for 12.4% of the country's GDP (Jain 2018). The AI market is expanding rapidly, with Vision 2030 aiming for the nation to rank in the top 20 of the world's competitiveness index. By the end of 2024, Saudi Arabia is expected to spend over \$11 billion on IT, primarily cloud and artificial intelligence technologies (The Ministry of Finance 2024). A Deloitte survey shows that 63% of Saudi businesses are using or intending to use AI technologies to improve business processes, such as accounting and auditing. However, cybersecurity issues remain a concern, with over 70% of enterprises experiencing at least one hack the previous year (Deloitte 2023). Thus, Saudi organizations increasingly recognize IT as a necessity rather than a luxury, utilizing it to enhance performance, meet customer expectations, and reduce costs while maintaining service quality. The country's dynamic blend of traditional culture and modern economic and corporate realities makes it an ideal study location (Abu-Musa 2008). Saudi Arabia is advancing AI adoption in various sectors, including education, but its implementation of AI-based learning outcomes is still in its early stages (Alotaibi and Alshehri 2023). Artificial intelligence techniques such as machine learning and predictive analysis are used to predict financial trends and analyze performance (Rahman et al. 2022). The Kingdom of Saudi Arabia is integrating big data and the Internet of Things in various industries, including higher education, banking, and healthcare. Schools use big data to optimize resource allocation, student enrollment, and academic success.

The accounting and auditing profession in the Kingdom has traditionally relied on manual processes, paper documentation, and manual inspection, which increase the risk of errors and complicate the search and retrieval process. However, adopting modern technology has led to significant changes in the profession (Abdullah and Almaqtari 2024). Saudi Arabia is embracing digital transformation in its accounting and auditing profession, with companies investing in enterprise resource management systems (ERP) like SAP and Oracle to automate processes and standardize financial data (AlGhazzawi 2020). Thus, as Saudi Arabia is transforming into the digital era, the transformative influence of AI on its accounting and auditing operations has become apparent. In Saudi Arabia, adopting AI and technological information can lead to new changes in structure (Rahman et al. 2022), such as raising necessity and accuracy, improving transparency and accountability (Almaqtari et al. 2022; Razi and Madani 2013), developing modern skills of accountants and auditors in data technology and analysis (Rahman et al. 2022), and enhancing partial capacity enhancement (Al-Htaybat et al. 2018). The banking industry uses big data to monitor customer service feedback and cash flow (Rahman et al. 2022). Companies benefit from cloud providers' advanced cybersecurity services to protect sensitive financial data (Alhumoudi and Juayr 2023; Al-Baity 2023). Saudi Arabia's financial sector is transforming significantly due to the integration of cloud computing, big data analytics, and artificial intelligence into accounting and auditing methods (Alzahrani 2024; Hamza et al. 2024).

2.2. The Impact of Artificial Intelligence on Accounting and Auditing

AI has revolutionized the accounting and auditing by enhancing accuracy, efficiency, and strategic value (Faccia et al. 2019; Gotthardt et al. 2020; Lee and Tajudeen 2020; Shaffer et al. 2020; Vărzaru 2022; Warren et al. 2015; Yoon 2020). AI in accounting has the potential to advance the field by prioritizing analytical and interpretive abilities over administrative tasks (O’Leary 2009). It can examine complete datasets (Faccia et al. 2019; Lee and Tajudeen 2020), detect anomalies (Brown-Liburd and Vasarhelyi 2015), and use predictive analytics (Earley 2015; Yoon 2020) to identify fraud and abnormalities more quickly and precisely (Lee and Tajudeen 2020; Yoon 2020). Further, the continuous monitoring of financial activity and transactions allows for real-time oversight, making audits more timely and strengthening the capacity to identify and address problems as they arise (Munoko et al. 2020). Based on this discussion, the following hypothesis is posited:

H1: *Artificial intelligence tools have a significant influence on transforming accounting and auditing operations in Saudi Arabia.*

AI tools are revolutionizing accounting and auditing by handling large amounts of financial data (Faccia et al. 2019; Gotthardt et al. 2020; Huerta and Jensen 2017; Lee and Tajudeen 2020; Sutton et al. 2016), identifying anomalies and trends (Earley 2015; Schmitz and Leoni 2019), and improving financial forecasting (Shaffer et al. 2020; Yoon 2020), fraud detection (Earley 2015; Hooda et al. 2020; Noor and Mansor 2019), and decision-making (Huerta and Jensen 2017; Kopalle et al. 2022; Sutton et al. 2016; Yoon 2020). Big data analytics enable auditors to analyze complete datasets (Alles and Gray 2016; Hooda et al. 2020;; Kopalle et al. 2022; Sutton et al. 2016; Yoon 2020), detecting trends (Faccia et al. 2019; Yoon 2020), abnormalities (Cockcroft and Russell 2018; Salijeni et al. 2019; Warren et al. 2015), and potential risks (Brown-Liburd and Vasarhelyi 2015; Gotthardt et al. 2020), leading to more precise and thorough audit preparation and planning. In the same context, big data solutions automate data gathering and analysis (Shaffer et al. 2020; Yoon 2020) in the audit implementation and workflow, reducing manual labor and increasing productivity (Gotthardt et al. 2020; Wamba-Taguimdje et al. 2020). Continuous auditing, where transactions are tracked and examined as they occur, facilitates the early identification of problems and timely resolution (Abdullah and Almaqtari 2024). Further, the thorough analysis of big data improves audit reports, providing a comprehensive, data-driven picture of an organization’s financial health (Alles and Gray 2016; Brown-Liburd and Vasarhelyi 2015; Earley 2015; Warren et al. 2015). Big data analytics in accounting also increases costing accuracy by examining vast amounts of operational and transactional data, allowing accountants to pinpoint cost centers and distribute expenses more accurately (Cockcroft and Russell 2018; Earley 2015; Huerta and Jensen 2017). It also integrates real-time data from multiple sources to ensure compliance and accuracy for financial reporting and taxation, reducing the possibility of mistakes and fines (Faccia et al. 2019; Lee and Tajudeen 2020; Munoko et al. 2020; Shaffer et al. 2020; Vărzaru 2022). In addition, big data impacts budgeting and strategic planning, enabling organizations to create more precise and flexible budgets by examining past data and forecast patterns (Abdullah and Almaqtari 2024). Thus, the following hypothesis is formulated:

H1a: *Big data has a significant influence on transforming accounting and auditing operations in Saudi Arabia.*

Machine learning algorithms and robotic process automation (RPA) are examples of AI-powered systems that streamline tasks like data entry, invoice processing, and reconciliation (Gotthardt et al. 2020; Lee and Tajudeen 2020; Vărzaru 2022). AI also enables sophisticated data analytics, providing accountants with a better understanding of financial performance and patterns, enabling better strategic planning and decision-making (Faccia et al. 2019; Lee and Tajudeen 2020; Yoon 2020). Deep learning algorithms, which continuously learn from

large datasets, automate the detection of fraud and abnormalities in auditing, improving audit preparation and planning by pointing out high-risk locations that need further investigation (Brown-Liburd and Vasarhelyi 2015; Gotthardt et al. 2020; Munoko et al. 2020; Yoon 2020). Thus, the following hypothesis is formulated:

H1b: *Deep learning has a significant influence on transforming accounting and auditing operations in Saudi Arabia.*

Accounting and auditing have transformed because cloud computing has increased efficacy, accuracy, and efficiency (Abdullah and Almaqtari 2024; Chen 2021). It allows accountants and auditors to access financial data (Groomer and Murthy 2018; Lee and Tajudeen 2020) anywhere (Faccia et al. 2019), reducing human error and allowing for more efficient reporting and audits (Faccia et al. 2019; Lee and Tajudeen 2020). Cloud-based accounting software like Xero, Sage, SAP, Automation Anywhere, and Financio automate repetitive operations, reducing human error risk (Lee and Tajudeen 2020). Cloud computing also offers financial savings by eliminating the need for expensive physical IT infrastructure and allowing businesses to optimize operating costs through pay-as-you-go cloud services (Di Vaio et al. 2020; Salijeni et al. 2019; Wamba-Taguimdje et al. 2020).

Cloud service providers invest in security measures to protect against hacking (Gotthardt et al. 2020) and data breaches (Munoko et al. 2020), offering advanced features like encryption (Gomez 2018; Yoon 2020), multi-factor authentication (Schmitz and Leoni 2019; Yoon 2020), and frequent security assessments (Brown-Liburd and Vasarhelyi 2015; Gotthardt et al. 2020). Cloud computing solutions also provide numerous disaster recovery options (Faccia et al. 2019), ensuring business continuity and allowing quick recovery from setbacks (Almaqtari et al. 2022). Moreover, advanced analytics and real-time reporting enable accountants to create comprehensive financial reports, conduct trend analysis, and make data-driven decisions (Sutton et al. 2016; Yoon 2020). Real-time data access also enables auditors to conduct continuous audits, making audits more efficient and timely (Brown-Liburd and Vasarhelyi 2015; Shaffer et al. 2020; Yoon 2020). Because cloud computing gives users access to advanced analytical tools and real-time financial data, it makes budgeting and strategic planning easier (Abdullah and Almaqtari 2024). To this end, the following hypothesis is developed:

H1c: *Cloud computing has a significant influence on transforming accounting and auditing operations in Saudi Arabia.*

2.3. The Mediating Role of IT Governance on the Relationship between Artificial Intelligence and Accounting and Auditing

While AI has revolutionized accounting and auditing, effective information technology governance (ITG) is essential for effectively using these tools. There are challenges to integrating AI in accounting and auditing, such as alignment and strategic focus (Abdullah and Almaqtari 2024). Moreover, it is crucial to ensure that AI systems are impartial, transparent, and safe, as any biases or faults in the algorithms could lead to severe mistakes or unethical behavior (Faccia et al. 2019; Gotthardt et al. 2020; Sutton et al. 2016; Yoon 2020). Therefore, the successful application of AI technologies in accounting and auditing depends on robust IT governance (Abdullah and Almaqtari 2024), which ensures the ethical, secure, and successful deployment and use of AI tools (Gotthardt et al. 2020; Papagiannidis et al. 2023). Further, there are issues to consider, such as bias (Gotthardt et al. 2020; Sutton et al. 2016), data quality (Sutton et al. 2016; Yoon 2020), lack of interpretability and transparency (Faccia et al. 2019; Gotthardt et al. 2020; Yoon 2020), interaction with current systems (Al-Hattami 2023; Al-Hattami and Almaqtari 2023; Sutton et al. 2016), and skills deficiencies in the workforce (Lee and Tajudeen 2020; Munoko et al. 2020). Thus, to address these issues, risk management, standardization and accountability, data security and privacy rules, and IT governance are essential (Abdullah and Almaqtari 2024).

Integrating AI tools, such as “Big Data, Deep Learning, and Cloud Computing”, revolutionizes accounting and auditing operations by improving productivity, accuracy, and strategic insight. However, substantial information technology governance (ITG) is essential for effectively implementing these tools. ITG ensures that AI technologies are implemented and used efficiently, safely, and morally responsibly (Awwad and El Khoury 2021; Cath 2018). ITG frameworks guarantee data integrity and confidentiality by ensuring AI applications follow legal and security requirements (Awwad and El Khoury 2021; Floridi 2018; Savtschenko et al. 2017; Winfield et al. 2019). They also require documentation and frequent audits of AI systems to preserve the integrity of audit and accounting procedures (Abdullah and Almaqtari 2024; Papagiannidis et al. 2023). Consequently, the following hypothesis is stated:

H2: *IT Governance mediates the relationship between AI tools (“Big Data, Deep Learning, and Cloud Computing”) and digitized accounting and auditing operations in Saudi Arabia.*

3. Research Design and Method

3.1. Sample and Tools of Analysis

The data used for the current study was collected from a research population of participants from different Saudi Arabian business organizations. The data was collected using several non-probability sampling methods, including convenience sampling. Further, the snowball sampling technique was also used to enhance the targeted sample and obtain more relevant data from the targeted respondents. At the initial stage, the study used convenience sampling to gather many responses quickly and affordably, eliminating the need for random sampling (Gomez 2018; Al Omari 2016; Wilkin et al. 2016). It is beneficial when limited time and resources allow early findings and pattern identification (Almaqtari et al. 2022; Wilkin et al. 2016). However, it has some limitations, including selection bias and limited generalizability. The study collected data from multiple sources and digital platforms via Google Docs and social media platforms to address this issue.

Further, we used another sampling technique, which is snowball sampling. The study used snowball sampling to overcome the bias issues that may arise from convenience sampling and to obtain more relevant and reliable data from specialized and respective respondents. In this method, the initial respondents find new participants from their network, increasing the sample size and possibly reaching people who might have yet to be reached by conventional sampling techniques (Gomez 2018; Al Omari 2016). This combination strategy improves the diversity and representativeness of the sample and is consistent with previous literature approaches (Abdullah and Almaqtari 2024; Al-Hattami and Almaqtari 2023; Almaqtari et al. 2022).

Several respondents from several Saudi Arabian organizations were targeted to collect the data required for the study. The sample includes respondents from accounting professionals, external and internal auditors, firms’ board members, chief and financial executive officers, managers, and other IT specialists. We surveyed (i) their perception of the impact of AI on accounting and auditing operations and (ii) the impact of information technological governance in this context. These respondents were targeted as they deal with accounting operations and AI tools, adopt accounting and management systems, audit these systems, and operate and plan them. Thus, their perception could help investigate real-world practices of integrating AI tools into accounting transactions. Accordingly, the study aimed to collect sufficient responses to analyze the data. For this purpose, the study used G-Power software tools and other sampling techniques to estimate the data required for the current study.

3.2. Questionnaire Design and the Research Instrument

This study investigates the relationship between emerging technologies, IT governance, accounting, and auditing operations. It uses a research instrument incorporating AI tools, including “Big Data, Deep Learning, Cloud Computing”, IT governance, and accounting and auditing operations constructs. The survey used in the current research was designed following similar prior studies that highlight the impact of AI and cloud computing on organizational processes (Di Vaio et al. 2020; Losbichler and Lehner 2021; Papagiannidis et al. 2023). The study also followed other prior studies that emphasize the importance of IT governance in enabling enterprises to effectively utilize these technologies (Abdullah and Almaqtari 2024; Almaqtari et al. 2022). The research instrument commences with the demographic variables section that captures the respondents’ characteristics. Then, the survey provides insights into audit planning, procedure, and reporting and highlights the role of IT governance in integrating AI, big data, and cloud computing in accounting and auditing functions. The questionnaire captures the complexities of emerging technologies and their impact on accounting operations and auditing. The survey was designed based on nine items that capture AI variables (three items each), four items that measure IT governance, nine items that proxy auditing practices, and nine items for accounting practices. Table 1 presents the measurements and synthesized variables corresponding to each construct.

Table 1. Measurements of the variables.

Constructs	Indicators	Symbol	Items	Synthesized Literature
AI	“Big Data”	BD	3	(Mikalef and Gupta 2021)
	“Deep Learning”	DL	3	(Sun and Vasarhelyi 2018; Issa et al. 2016)
	“Cloud Computing”	CC	3	(Mikalef and Gupta 2021)
IT Governance	IT Governance	ITG	4	(Almaqtari et al. 2024)
Auditing functions	Audit Preparation and Planning	ADPL	4	(Issa et al. 2016)
	Audit Process	ADP	3	
	Audit Reporting	ADRP	2	
Accounting operations	Costing	COS	3	(Aqlan 2021)
	Reporting and Taxation	RT	3	
	Strategic Planning and Budgeting	STB	3	

3.3. Statistical Setting

This study employed a comprehensive statistical setting to ensure the robustness and validity of the results. The study follows Li et al. (2022) in some aspects of the statistical tools used. At the initial stage, filter analysis was conducted, including frequency analysis, normality, and extreme value analysis. The process included data filtering and visualization to remove incomplete or inconsistent responses, frequency, and descriptive statistics to understand the distribution of responses across different categories, as well as normality analysis using kurtosis and skewness to assess normality. Further, the study estimates the data using a sampling adequacy test using SPSS 23, which reports that the sample is adequate. Sampling adequacy, KMO, and Bartlett’s Tests were used to evaluate a sample of 228 surveys, and the results verified that the sample size was adequate for factor and predictive analysis. According to the findings, the data were appropriate for exploratory factor analysis. The sampling adequacy was assessed using the Kaiser–Meyer–Olkin (KMO) Test, with a KMO value of 0.927, which is higher than the criterion value (0.50) (Krichene and Baklouti 2020), indicating an adequate sample size for factor analysis. Confirmatory factor analysis (CFA) was used to test the validity of the constructs and confirm whether the data fit the hypothesized measurement model. Reliability and validity analyses were also conducted using Cronbach’s alpha (CA) to assess the internal consistency of the constructs. Rho_A assesses internal consistency dependability, suggesting a group of items in a scale or construct that measures the same principle (Al-Hattami 2023). The reliability of a latent

construct was evaluated using composite reliability, which takes into account both the construct's variation and the error variance. Rho_A values vary between 0 and 1, with larger values suggesting stronger internal consistency among the components (Al-Hattami and Almaqtari 2023).

CR values vary from 0 to 1, with values greater than 0.7 being accepted as reliable (Al-Hattami 2023). AVE assesses convergent validity by comparing the variance captured by latent concept indicators to the measurement error (Almaqtari et al. 2022). Convergent validity refers to the degree to which various indicators of a latent construct are connected, implying that they measure the same underlying construct. The AVE values range from 0 to 1, with higher values suggesting that the construct's indicators account for a more significant proportion of the variance. An average variance extracted (AVE) value greater than 0.4 should be considered evidence of convergent validity (Hu and Bentler 1998; Hu et al. 2022). The results show that constructs with AVE values greater than 0.5 indicate good convergent validity. Finally, partial least squares (PLS) modeling was used to estimate the results. The interrelationships among the constructs were comprehensively analyzed using path analysis, confirmatory factor analysis (CFA), and structural equation modeling (SEM) to explore the effects and relationships among the variables. Additionally, all hypotheses (H1, H1a, H1b, H1c, H1d, and H2) were tested using structural equation modeling (SEM) to test the hypothesized relationships among the constructs.

4. Empirical Results

4.1. Model's Measurement

Confirmatory Factor Analysis and Reliability Analysis

The confirmatory factor analysis (CFA) and reliability analysis of the measurement model reveal robust psychometric properties across multiple constructs. The Cronbach's alpha (CA), rho_A, composite reliability (CR), and average variance extracted (AVE) values are reported for each construct, demonstrating strong conceptual validity and internal consistency. Table 2 demonstrates their findings. The big data (BD) construct has high item loadings, with Cronbach's alpha values above acceptable thresholds. Deep learning (DL) also shows high item loadings, indicating its reliability and reliability. Cloud computing (CC) has item loadings that exceed minimum acceptable levels, indicating acceptable reliability and validity. IT governance (ITG) items load strongly, indicating excellent reliability and validity. Audit preparation and planning (ADPL) items have high loadings, which confirms their reliability. Audit process (ADP) items have loadings that indicate good internal consistency and validity.

Audit findings report (ADRP) items have high factor loadings, with CA values exceeding 0.70, CR values above 0.80, and AVE values well above 0.50. Strategic planning and budgeting (STP) items load strongly, reflecting excellent reliability and validity. Reporting and taxation (RT) items show high loadings, confirming strong reliability and validity. Costing (COS) items have high factor loadings, indicating outstanding reliability and validity. Overall, the constructs demonstrate high reliability and validity, with CA values exceeding 0.70, CR values above 0.80, and AVE values well above 0.50, aligning with recommended threshold values for confirming the adequacy of measurement models. The highest CA value is observed in the Costing (COS) construct, while the lowest is still acceptable in cloud computing (CC). This indicates that the measurement model is robust and suitable for further structural analysis.

Figure 1 shows the confirmatory factor analysis (CFA) model. The CFA model is typically estimated using SmartPLS software, which examines the interrelationships between latent variables and their observed indicators. It comprises the latent variables, observable indicators, directional relationships, and factor loadings. The model examines the relationships between AI variables, including big data, deep learning, and cloud computing, which are independent variables. IT governance is a mediating variable between these variables and auditing and accounting practices (DVs).

Table 2. Factor loadings and CFA results.

Items	1	2	3	4	5	6	7	8	9	10	CA	rho_A	CR	AVE
BD1	0.878													
BD2	0.905										0.844	0.849	0.906	0.763
BD3	0.837													
DL1		0.900												
DL2		0.858									0.866	0.874	0.918	0.789
DL3		0.906												
CC1			0.801											
CC2			0.832								0.751	0.752	0.857	0.667
CC3			0.816											
ITG1				0.844										
ITG2				0.905							0.884	0.888	0.920	0.743
ITG3				0.835										
ITG4				0.861										
ADPL1					0.775									
ADPL2					0.906						0.812	0.823	0.889	0.729
ADPL3					0.875									
ADP1						0.858								
ADP2						0.851					0.858	0.875	0.903	0.699
ADP3						0.789								
ADP4						0.843								
ADRP1							0.900				0.770	0.771	0.897	0.813
ADRP2							0.904							
STB1								0.909						
STB2								0.913			0.882	0.883	0.927	0.810
STB3								0.877						
RT1									0.843					
RT2									0.924		0.877	0.877	0.925	0.804
RT3									0.920					
COS1										0.932				
COS2										0.923	0.919	0.919	0.948	0.860
COS3										0.927				

“(1) Big Data, (2) Cloud _Computing, (3) Deep _Learning, (4) IT Governance, (5) Audit preparation and planning, (6) Audit implementation and workflow, (7) Audit Findings Report, (8) Strategic Planning and Budgeting, (9) Reporting & _Taxation, (10) Costing”.

4.2. Direct Effect

Figure 2 illustrates the hypothesized structural model for the variables under investigation. Figure 2 provides the structural equation modeling (SEM) model that estimates the direct and indirect relationship between the independent variables, AI indicators, and the dependent variables represented by accounting and auditing operations. The mediating effect of IT governance on the relationship between the independent and dependent variables is also demonstrated in SEM.

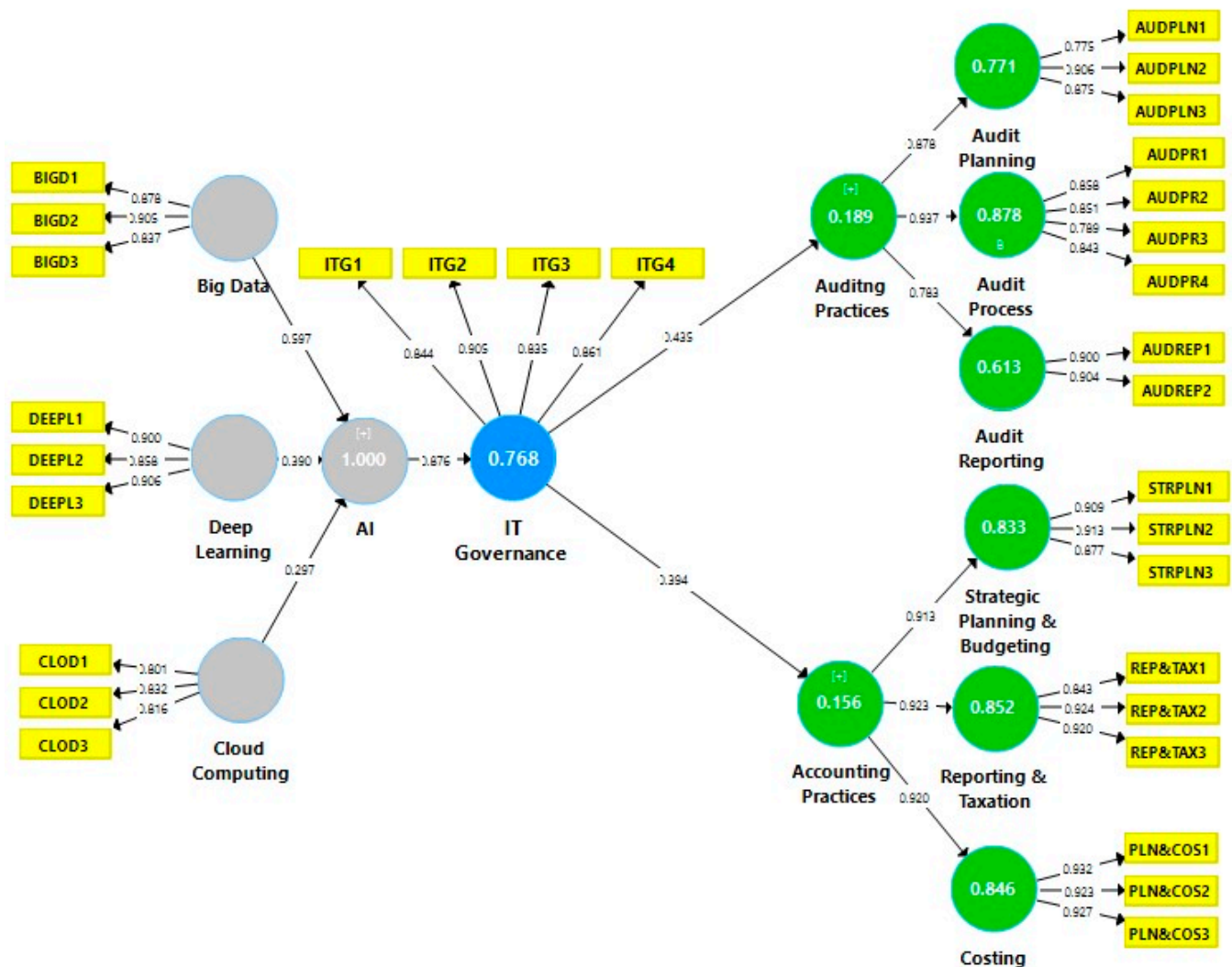


Figure 1. Confirmatory factor analysis.

The results in Table 3 demonstrate that AI has a positive and significant impact on information technology governance ($\beta = 1.002$, p value = $0.000 < 0.01$). This finding suggests that the inclusion of AI greatly increases the efficacy of IT governance. Additionally, IT governance has a significant and positive impact on accounting ($\beta = 0.430$, p value = $0.000 < 0.01$) and auditing ($\beta = 0.485$, p value = $0.000 < 0.01$) activities. These findings imply that IT governance significantly facilitates the execution of accounting and auditing operations.

Unexpectedly, these results imply that AI significantly affects Saudi Arabia's accounting and auditing activities. This is consistent with several research studies (Earley 2015; Gotthardt et al. 2020; Issa et al. 2016; Munoko et al. 2020; Schmitz and Leoni 2019; Sutton et al. 2016) that show how AI has a significant impact on accounting and auditing tasks. Further, several studies indicate the critical role that AI plays in improving the effectiveness and efficiency of accounting and auditing operations (Brown-Liburd and Vasarhelyi 2015; Earley 2015; Kopalle et al. 2022; Vărzaru 2022; S. Zhang et al. 2021). The successful implementation of these technologies required significant cultural and organizational changes, and businesses faced challenges like data sovereignty and regulatory compliance. Deep learning systems' improved fraud detection capabilities and the significant workforce upskilling investment underscored the broader implications.

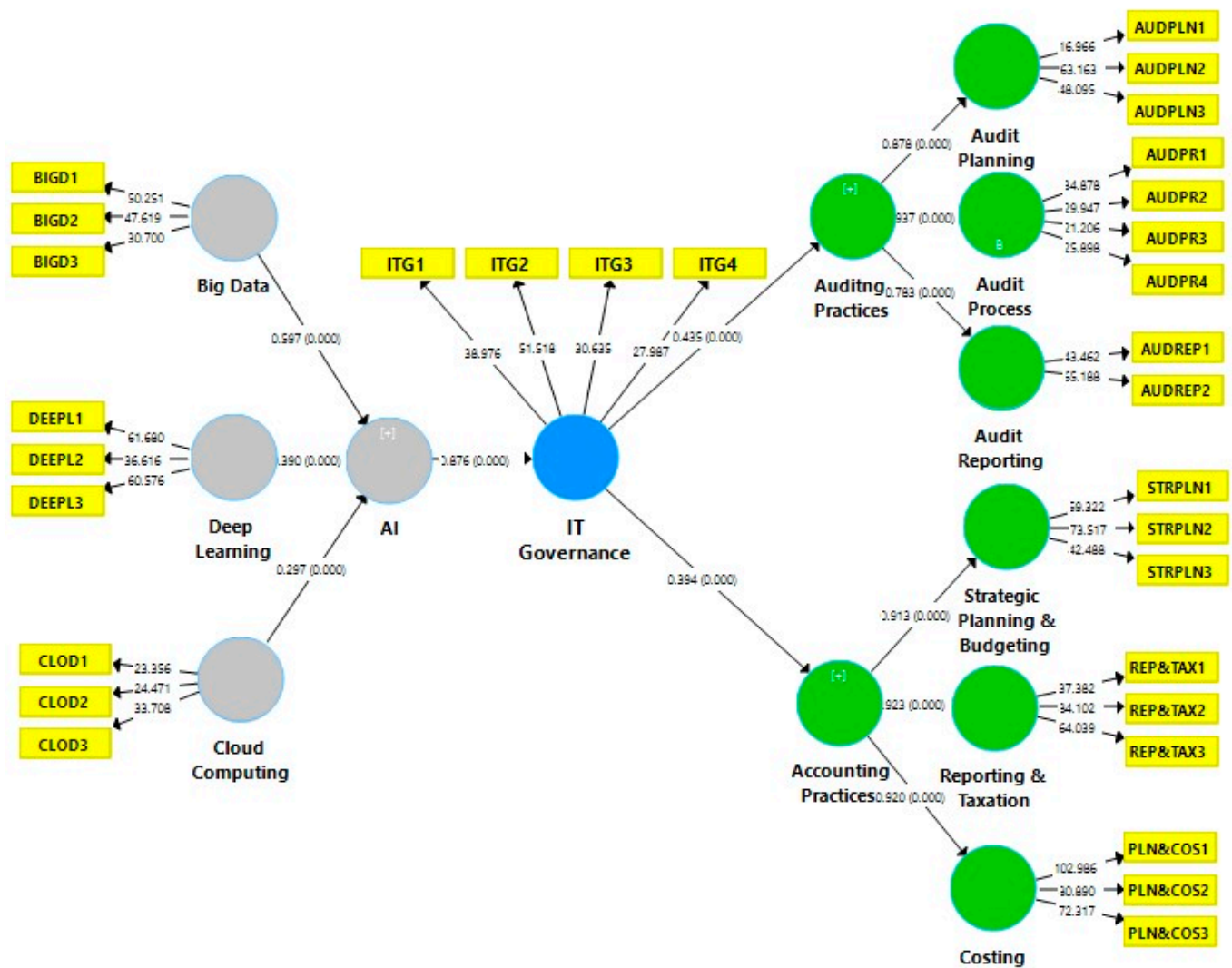


Figure 2. Structural equation model.

Table 3. SEM estimation.

Path	β	Standard Deviation	T Statistics	p Values
BD—AI	0.673	0.053	12.704	0.000
CC—AI	0.329	0.035	9.481	0.000
DL—AI	0.391	0.028	14.077	0.000
AI—ITG	1.002	0.018	56.443	0.000
ITG—Accounting Operations	0.430	0.076	5.640	0.000
ITG—Auditing functions	0.485	0.086	5.670	0.000
Auditing Functions—ADPL	1.017	0.023	45.003	0.000
Auditing Functions—ADP	1.052	0.016	66.225	0.000
Auditing Functions—ADRP	0.937	0.038	24.895	0.000
Accounting Operations—STB	0.999	0.012	84.235	0.000
Accounting Operations—RT	1.014	0.014	73.817	0.000
Accounting Operations—COS	0.987	0.011	87.650	0.000

The path from AI to IT governance (ITG) has a β value of 1.002 with a T statistic of 56.443 and a p value of 0.000, indicating a highly significant impact. Furthermore, the paths from ITG to accounting operations and auditing functions show significant effects ($\beta = 0.430$ and 0.485 , respectively, with p values of 0.000). These results are consistent with the hypothesis that AI tools significantly transform accounting and auditing operations, supporting H1. This indicates that H1, which states AI tools have a significant influence on transforming accounting and auditing operations in Saudi Arabia, is accepted, answering the research question of AI's influence on accounting and auditing operations. The results demonstrate that AI positively and significantly affects accounting and auditing practices. This is in line with [Faccia et al. \(2019\)](#) and [Lee and Tajudeen \(2020\)](#), who found that AI enhances the accuracy and efficiency of accounting and auditing by automating routine tasks and providing advanced data analysis capabilities. Similarly, [Brown-Liburd and Vasarhelyi \(2015\)](#) and [Yoon \(2020\)](#) noted that AI's ability to process large datasets and identify anomalies improves fraud detection and decision-making. [Munoko et al. \(2020\)](#) also emphasized that continuous monitoring enabled by AI allows real-time oversight, thus improving the timeliness and reliability of audits.

The influence of big data (BD) on AI is 0.673, indicating a T statistic of 12.704 and a p value of 0.000. This significant positive relationship indicates that big data plays a crucial role in enhancing AI capabilities, which, in turn, transform accounting and auditing operations. The robust T statistic supports the hypothesis H1a. This is consistent with [Alles and Gray \(2016\)](#) and [Brown-Liburd and Vasarhelyi \(2015\)](#), who highlighted that big data analytics allow auditors to analyze complete datasets, detect trends, and identify risks more effectively. [Cockcroft and Russell \(2018\)](#) and [Shaffer et al. \(2020\)](#) also noted that big data supports continuous auditing, enabling real-time problem identification and resolution. These findings align with the notion that big data leads to more precise audit planning and execution, reducing manual labor and increasing productivity ([Gotthardt et al. 2020](#)).

The results also provide surprising insights. Deep learning (DL) to AI is also highly significant, with a β value of 0.391, a T statistic of 14.077, and a p value of 0.000. These results suggest that deep learning contributes significantly to AI's effectiveness in transforming accounting and auditing processes, supporting H1b. This is in line with [Gotthardt et al. \(2020\)](#), who found that deep learning algorithms automate fraud detection and anomalies, improving the accuracy of audit preparations. [Munoko et al. \(2020\)](#) and [Yoon \(2020\)](#) also noted that by continuously learning from large datasets, these algorithms enhance the identification of high-risk areas, facilitating more targeted and efficient audits. The successful deployment of these technologies necessitates significant cultural adaptation and organizational change, forcing businesses to reconsider their established processes. Deep learning technology has greatly surpassed traditional methods for detecting financial fraud, minimizing inconsistencies, and increasing trust in financial reports. Integrating new technologies necessitates significant investments in workforce upskilling and reskilling, emphasizing the importance of specialized educational efforts.

Similarly, the path from cloud computing (CC) to AI shows a significant effect, with a β value of 0.329, a T statistic of 9.481, and a p value of 0.000. This indicates that cloud computing significantly enhances AI functionalities, which is critical for transforming accounting and auditing operations, thus supporting H1c. This is consistent with the findings of [Groomer and Murthy \(2018\)](#) and [Lee and Tajudeen \(2020\)](#), who stated that cloud computing increases the efficiency and accuracy of accounting and auditing by providing access to financial data anytime, anywhere. [Di Vaio et al. \(2020\)](#) and [Faccia et al. \(2019\)](#) also highlighted that cloud-based solutions automate repetitive tasks, reduce human error, and offer significant cost savings by eliminating the need for expensive IT infrastructure. These points align with the view that enhanced security measures and disaster recovery options ensure business continuity and data protection ([Gotthardt et al. 2020](#); [Munoko et al. 2020](#)).

Overall, the results provide robust evidence supporting the hypotheses. AI tools, driven by big data, deep learning, and cloud computing, positively and significantly transform accounting and auditing operations. This is consistent with the literature, which

underscores the transformative potential of AI and its foundational technologies in financial operations.

4.3. Indirect Moderating Effect

Table 4 illustrates the mediating role of ITG. Panel (A) shows that ITG significantly and positively mediates the relationship between big data and accounting and auditing functions. The positive coefficients indicate that IT governance mediates by optimizing technological infrastructure, ensuring data quality, and providing secure and efficient auditing processes. Organizations that invest in robust IT governance structures can fully leverage the potential of big data in their accounting and auditing functions, resulting in more accurate decision-making, streamlined processes, and improved financial outcomes. Furthermore, strong IT governance leads to more informed decision-making, efficient processes, and reliable reporting.

Table 4. SEM estimation—indirect moderating effect.

Path	β	Standard Deviation	T Statistics	p Values
Panel (A): ITG—Big Data—Accounting and Auditing functions				
Big Data—AI—ITG	0.675	0.060	11.291	0.000
Big Data—AI—ITG—Auditing Functions	0.327	0.053	6.160	0.000
Big Data—AI—ITG—Auditing Functions—Audit Preparation and Planning	0.333	0.056	5.931	0.000
Big Data—AI—ITG—Auditing Functions—Audit Implementation and Workflow	0.344	0.056	6.169	0.000
Big Data—AI—ITG—Auditing Functions—Audit Findings Report	0.306	0.053	5.803	0.000
Big Data—AI—ITG—Accounting Operations	0.290	0.047	6.182	0.000
Big Data—AI—ITG—Accounting Operations—Strategic Planning and Budgeting	0.290	0.048	6.076	0.000
Big Data—AI—ITG—Accounting Operations—Reporting and Taxation	0.294	0.049	6.051	0.000
Big Data—AI—ITG—Accounting Operations—Costing	0.287	0.047	6.087	0.000
Panel (B): ITG—DL—Accounting and Auditing Functions				
Deep_Learning—AI—ITG	0.392	0.030	13.208	0.000
Deep_Learning—AI—ITG—Auditing Functions	0.190	0.032	5.940	0.000
Deep_Learning—AI—ITG—Auditing Functions—Audit Preparation and Planning	0.193	0.034	5.764	0.000
Deep_Learning—AI—ITG—Auditing Functions—Audit Implementation and Workflow	0.200	0.033	5.988	0.000
Deep_Learning—AI—ITG—Auditing Functions—Audit Findings Report	0.178	0.032	5.649	0.000
Deep_Learning—AI—ITG—Accounting Operations	0.169	0.028	6.048	0.000
Deep_Learning—AI—ITG—Accounting Operations—Strategic Planning and Budgeting	0.168	0.028	5.914	0.000
Deep_Learning—AI—ITG—Accounting Operations—Reporting & Taxation	0.171	0.029	5.904	0.000
Deep_Learning—AI—ITG—Accounting Operations—Costing	0.166	0.028	5.962	0.000

Table 4. Cont.

Path	β	Standard Deviation	T Statistics	p Values
Panel (C): ITG < CC—Accounting and Auditing Functions				
Cloud_Computing—AI—ITG	0.330	0.035	9.528	0.000
Cloud_Computing—AI—ITG—Auditing Functions	0.160	0.037	4.335	0.000
Cloud_Computing—AI—ITG—Auditing Functions—Audit Preparation and Planning	0.162	0.038	4.295	0.000
Cloud_Computing—AI—ITG—Auditing Functions—Audit Implementation and Workflow	0.168	0.038	4.402	0.000
Cloud_Computing—AI—ITG—Auditing Functions—Audit Findings Report	0.150	0.036	4.134	0.000
Cloud_Computing—AI—ITG—Accounting Operations	0.142	0.035	4.109	0.000
Cloud_Computing—AI—ITG—Accounting Operations—Strategic Planning and Budgeting	0.142	0.035	4.047	0.000
Cloud_Computing—AI—ITG—Accounting Operations—Reporting & Taxation	0.144	0.035	4.058	0.000
Cloud_Computing—AI—ITG—Accounting Operations—Costing	0.140	0.034	4.064	0.000
Panel (D): ITG—AI—Accounting and Auditing Functions				
AI—ITG—Auditing Functions	0.486	0.085	5.708	0.000
AI—ITG—Auditing Functions—Audit Preparation and Planning	0.494	0.089	5.572	0.000
AI—ITG—Auditing Functions—Audit Implementation and Workflow	0.511	0.088	5.787	0.000
AI—ITG—Auditing Functions—Audit Findings Report	0.455	0.085	5.367	0.000
AI—ITG—Accounting Operations	0.431	0.077	5.599	0.000
AI—ITG—Accounting Operations—Strategic Planning and Budgeting	0.431	0.079	5.479	0.000
AI—ITG—Accounting Operations—Reporting and Taxation	0.437	0.080	5.484	0.000
AI—ITG—Accounting Operations—Costing	0.426	0.077	5.513	0.000
Panel (E): ITG—Accounting and Auditing Functions				
ITG—Auditing Functions—Audit Findings Report	0.454	0.085	5.339	0.000
ITG—Auditing Functions—Audit Implementation and Workflow	0.510	0.089	5.750	0.000
ITG—Auditing Functions—Audit Preparation and Planning	0.493	0.089	5.551	0.000
ITG—Accounting Operations—Strategic Planning and Budgeting	0.430	0.078	5.525	0.000
ITG—Accounting Operations—Reporting and Taxation	0.436	0.079	5.532	0.000
ITG—Accounting Operations—Costing	0.425	0.076	5.561	0.000

Panels (B–D) demonstrate that IT governance plays a crucial mediating role in the relationships between deep learning, cloud computing, and AI with accounting and auditing functions. IT governance establishes unified data governance policies to ensure data consistency and ethical use. It also defines ethical guidelines for deploying AI algorithms, ensuring transparency, fairness, and accountability (Nedbal et al. 2011; Schmidt and Kolbe 2011; Molla et al. 2009; Dhamija and Bag 2020; Handoko and Liusman 2021).

The path analysis shows significant effects from AI to IT Governance (ITG) ($\beta = 1.002$, $T = 56.443$, $p = 0.000$) and from ITG to both accounting operations ($\beta = 0.430$, $p = 0.000$)

and auditing functions ($\beta = 0.485, p = 0.000$). This is consistent with the hypothesis that AI tools significantly transform accounting and auditing operations, supporting H1. Similarly, the path coefficients indicate a significant positive relationship between big data and AI ($\beta = 0.673, T = 12.704, p = 0.000$) and through AI, ITG, auditing functions, and accounting operations. This strongly supports H1a. Further, the significant effect of deep learning on AI ($\beta = 0.391, T = 14.077, p = 0.000$) and the subsequent positive impact on ITG, auditing functions, and accounting operations support H1b. Similarly, the significant path from cloud computing to AI ($\beta = 0.329, T = 9.481, p = 0.000$) and the subsequent positive impacts on ITG, auditing functions, and accounting operations confirm H1c. Finally, big data, deep learning, and cloud computing affect AI, and ITG demonstrates significant mediation effects, supporting H2. This signifies H2, which states that IT governance mediates the relationship between AI tools (“Big Data, Deep Learning, and Cloud Computing”) and digitized accounting and auditing operations in Saudi Arabia. This answers the second research question about the role of IT governance in the relationship between AI tools and digitized accounting and auditing operations in Saudi Arabia. This indicates that IT governance is significant in the relationship between AI and digitized accounting and auditing operations. The path from big data to AI to ITG ($\beta = 0.675, T = 11.291, p = 0.000$) and from deep learning to AI to ITG ($\beta = 0.392, T = 13.208, p = 0.000$) both indicate strong mediation by ITG. This aligns with findings from Nedbal et al. (2011), Schmidt and Kolbe (2011), and Molla et al. (2009), indicating that effective IT governance is crucial for organizations to leverage AI while minimizing risks (Wang 2022; Xia et al. 2022).

The results are consistent with the argument that IT governance enforces data governance frameworks to maintain data quality and accuracy, enhancing the reliability of financial insights. Additionally, it ensures compliance with regulatory standards in deploying AI and cloud computing, adhering to legal requirements (Earley 2015; Gotthardt et al. 2020; Sutton et al. 2016; Yoon 2020). IT governance also guides the responsible use of resources, optimizing efficiency and cost-effectiveness in strategic planning, costing, budgeting, taxation, and auditing (Cockcroft and Russell 2018; Earley 2015; Gotthardt et al. 2020; Issa et al. 2016; Munoko et al. 2020; Schmitz and Leoni 2019). It includes risk management strategies to identify, assess, and mitigate AI and cloud computing risks. The mediating role of IT governance ensures a cohesive and responsible integration of AI and cloud computing into accounting and auditing functions, contributing to more robust, accurate, and responsible financial and audit practices.

5. Discussion and Implications

The study reveals robust evidence supporting the hypotheses that AI tools, driven by big data, deep learning, and cloud computing, positively and significantly impact transforming accounting and auditing operations in Saudi Arabia. Big data enhances AI capabilities and transforms accounting and auditing operations. Deep learning contributes substantially to AI's effectiveness in transforming accounting and auditing processes (Lee and Tajudeen 2020; Wamba-Taguimdje et al. 2020; Yoon 2020). Deep learning algorithms automate the detection of fraud and anomalies, improving the accuracy of audit preparations (Chen 2021; Lee and Tajudeen 2020; Yoon 2020). Cloud computing significantly enhances AI functionalities, which are critical for transforming accounting and auditing operations (Chen 2021; Faccia et al. 2019). Cloud-based solutions automate repetitive tasks (Munoko et al. 2020; Vărzaru 2022; Wamba-Taguimdje et al. 2020), reduce human error (Schmitz and Leoni 2019), and offer significant cost savings by eliminating the need for expensive IT infrastructure (Lee and Tajudeen 2020; Vărzaru 2022).

The results also indicate that the relationship between AI tools, including big data, deep learning, cloud computing, and accounting and auditing functions, is significantly mediated by IT governance. This is achieved by optimizing technological infrastructure, ensuring data quality, and providing secure and efficient auditing processes. Organizations that invest in robust IT governance structures can fully leverage the potential of big data in their accounting and auditing functions, resulting in more accurate decision-making, streamlined

processes, and improved financial outcomes (Almaqtari et al. 2022; Elazhary et al. 2022; Papagiannidis et al. 2023; Rubino and Vitolla 2014; Turel et al. 2017). While Elazhary et al. (2022) indicate that an organization's decision-making and streamlined processes are significantly influenced by IT governance, Turel et al. (2017) reveal a relationship between board-level information technology governance and organizational performance. Similarly, Papagiannidis et al. (2023) report that AI governance is essential for decision-making and overcoming barriers. In this context, Rubino and Vitolla (2014) conclude that IT governance is essential to enterprise risk management and financial outcomes. Further, IT governance plays a crucial mediating role in the relationships between deep learning, cloud computing, and AI with accounting information systems (Joshi et al. 2018; Papagiannidis et al. 2023; Rubino and Vitolla 2014; Abdullah and Almaqtari 2024; Al-Hattami et al. 2024; Allami et al. 2024; Almaqtari 2024; Almaqtari et al. 2022, 2024). Research suggests that AI greatly improves accounting systems (Al-Hattami et al. 2024; Allami et al. 2024), auditing, and operations (Abdullah and Almaqtari 2024) by automating routine tasks, enabling real-time data processing and offering predictive analytics (Al-Hattami et al. 2024). Joshi et al. (2018) indicate that IT governance frameworks enhance accountability and transparency by enhancing the external reporting of relevant IT information to stakeholders, particularly in strategic IT settings. Thus, this raises the importance of IT governance in AI integration, as it aids in prioritizing investments and fostering innovation (Almaqtari 2024). Similarly, Papagiannidis et al. (2023) highlight that AI governance is vital for effective decision-making and overcoming implementation challenges. Rubino and Vitolla (2014) also argue that IT governance is crucial for enterprise risk management and improving financial outcomes. IT governance establishes unified data governance policies to ensure data consistency and ethical use and defines ethical guidelines for deploying AI algorithms, ensuring transparency, fairness, and accountability (Joshi et al. 2018; Papagiannidis et al. 2023; Rubino and Vitolla 2014; Wamba-Taguimdje et al. 2020). IT governance enforces data governance frameworks to maintain data quality and accuracy, enhancing the reliability of financial insights (Elazhary et al. 2022; Erasmus and Marnewick 2021; Sofyani et al. 2020). It also ensures compliance with regulatory standards in deploying AI and cloud computing, adhering to legal requirements. The mediating role of IT governance ensures a cohesive and responsible integration of AI and cloud computing into accounting and auditing functions, contributing to more robust, accurate, and responsible financial and audit practices.

AI in accounting and auditing offers numerous benefits, such as increased accuracy, efficiency, and fraud detection skills. However, it also has drawbacks, such as high implementation costs, data privacy issues, and regulatory compliance issues. Effective IT governance is crucial for managing these problems and ensuring the successful integration of AI. IT governance frameworks help enterprises fully leverage AI while limiting related risks by enabling strategy alignment, risk management, resource allocation, and ethical monitoring. AI systems can process massive amounts of data with high precision, reducing the possibility of human error. They can automate repetitive processes, allowing accountants and auditors to focus on more strategic work. Real-time data processing improves the audit process's responsiveness. Advanced predictive analytics use past data to estimate future financial trends, assess risks, and find opportunities. Natural language processing (NLP) enables AI to evaluate unstructured data, extracting essential information and insights to aid audit processes. However, AI also has downsides, such as high implementation costs, concerns about data privacy and security, complexity and upkeep, legal and compliance issues, ethical considerations, and reliance on high-quality data (Alreemy et al. 2016; Awwad and El Khoury 2021; Joshi et al. 2018). Effective IT governance ensures that AI investments align with the organization's financial and operational strategies, efficiently distribute resources, measure performance using metrics and KPIs, and establish compliance and accountability systems (Awwad and El Khoury 2021; Caluwe and De Haes 2019; Tallon et al. 2013; Vejseli et al. 2018). Thus, effective IT governance is crucial for successfully integrating AI into accounting and auditing. It involves strategic

alignment, risk management, resource allocation, performance measurement, compliance, responsibility, change management, ethical concerns, and continuous improvement.

AI integration in accounting and auditing is a growing global phenomenon, with firms worldwide using AI to improve their financial operations (Damerji and Salimi 2021; Kopalle et al. 2022; Yoon 2020; S. Zhang et al. 2021). AI adoption in accounting and auditing is diverse, with North America focusing on fraud detection, European countries focusing on data privacy and regulatory compliance, Asia utilizing AI in fintech, the Middle East investing in AI technologies, and Africa focusing on increasing financial inclusion and combating fraud. Notable examples include Deloitte, PwC, EY, and KPMG in the US, pioneering AI integration into audit procedures for risk assessment, fraud detection, and predictive analytics. While Zhang et al. (2020), Tiberius and Hirth (2019), and Salijeni et al. (2019) indicate that AI affects auditing practices in European countries, including Germany, the UK, and France, Munoko et al. (2020) indicate that the European Commission's Expert Group on artificial intelligence emphasizes the need for AI-implementing firms to provide stakeholders with clear, proactive information about AI system capabilities and limitations. They all indicate that Europe, mainly the UK, Germany, and France, is adopting legal frameworks to enable AI innovation while preserving data protection and ethical norms (Munoko et al. 2020; Salijeni et al. 2019; Tiberius and Hirth 2019; Zhang et al. 2020). Companies are also using AI to comply with regulations like GDPR, improving their ability to manage big data volumes and maintain regulatory compliance (Zhang et al. 2020). Asia, particularly China and Japan, is investing in AI technologies to automate operations (Kopalle et al. 2022; O'Leary 2009; Zhang et al. 2020). AI is not limited to accounting and auditing functions in the private sector; the government sector also tries to improve its operations through AI integration. For instance, the Australian government is investing \$124.1 million in an AI Action Plan to enhance its AI capabilities, while the Hong Kong Department of Transport has been using AI for over a decade to collect and classify cyber security information (Yigitcanlar et al. 2023). Thus, IT governance is crucial in the modern government sector, especially in AI adoption. It ensures strategic alignment with government goals, controls risks, promotes accountability, and protects data quality, integrity, and security. It addresses ethical issues like spying and decision-making openness (Abdullah and Almaqtari 2024; Al-Hattami et al. 2024; Allami et al. 2024; Almaqtari 2024; Almaqtari et al. 2022, 2024). These studies indicate that AI significantly enhances accounting systems (Al-Hattami et al. 2024; Allami et al. 2024), audits, and operations (Abdullah and Almaqtari 2024) by automating routine processes, enabling real-time data processing, and providing predictive analytics (Al-Hattami et al. 2024). They also indicate that IT governance is crucial for AI integration, facilitating investment prioritization and innovation (Almaqtari 2024).

The study highlights the need for cultural adaptation and organizational change to implement AI successfully. It suggests the need for educational and training programs to include the skills needed to handle advanced technologies, highlighting a curriculum gap. An interdisciplinary approach to academic education is also necessary, incorporating aspects of information technology, graphic analysis, and management sciences. The study also calls for developing educational and training programs aligned with the Kingdom's Vision 2030, which focuses on digital transformation and technological innovation. The study also underscores the need for cooperation between academia and industry to develop educational and training solutions based on actual practitioners' needs, which aligns with national development goals and Vision 2030. Moreover, the study adds to the literature regarding the effects of technological changes on job roles in accounting and auditing within the Kingdom. The results indicate the need to redefine and expand the scope of job skills to include technical and analytical capabilities, which calls for updating academic research to keep pace with these transformations and achieve the aspirations of Vision 2030.

This study provides practical insights for Saudi companies and institutions implementing artificial intelligence, big data analytics, cloud computing, and deep learning technologies in accounting and auditing functions. It emphasizes the need for cultural

adaptation and organizational change management, as success depends on creating an appropriate organizational and cultural environment. Companies should build advanced technical capabilities within work teams through training and development programs, including those dealing with artificial intelligence and big data analytics. Investments in technical infrastructure, such as modernizing technological systems and using cloud computing effectively, are crucial for supporting these transformations. Advanced technologies can enhance transparency and credibility in financial reporting, leading to economic stability and confidence among investors and stakeholders. They can also provide new job opportunities that require high technical skills, pushing the local workforce towards specializations in line with the Kingdom's Vision 2030 goal of building a diverse and prosperous knowledge economy. These improvements can promote responsible and sustainable business practices, such as improving auditing and fraud detection processes. The study also highlights the need for regulatory policies that support technological innovation while protecting data and privacy rights, requiring a careful balance between technological progress and ethical and social considerations. Adopting advanced technologies can contribute to achieving sustainable development goals and promote economic and social growth in Saudi Arabia.

6. Conclusions

This paper investigates the mediating role of IT governance in the relationship between AI and accounting and auditing functions. Data were collected from various Saudi organizations using convenience and snowball sampling methods, resulting in a final sample of 228 respondents. The findings reveal that IT governance significantly and positively mediates the relationship between AI tools (big data, deep learning, and cloud computing) and auditing functions (audit preparation and planning, process, and reporting). Similarly, IT governance significantly mediates between AI and accounting operations (strategic planning, reporting and taxation, and costing). This suggests that integrating AI, especially big data, deep learning, and cloud computing, has substantially transformed accounting and auditing functions. IT governance ensures these technologies' ethical, secure, and efficient use by establishing unified data governance policies, maintaining data quality and security, and defining ethical guidelines for AI deployment to ensure transparency, fairness, and accountability. It also enforces data governance frameworks to maintain quality and accuracy standards and guides adherence to regulatory standards, ensuring responsible AI and cloud computing deployment. Additionally, IT governance optimizes strategic planning, costing, budgeting, taxation, and auditing processes and includes risk management strategies to identify, assess, and mitigate risks associated with AI and cloud computing.

The study aims to fill a gap in prior research by examining the adoption and implementation of AI in accounting and auditing practices. It also enhances understanding of the role of IT governance in the relationship between AI and accounting and auditing operations, making it a unique and novel contribution to the existing knowledge. The study provides research-based perspectives from Saudi Arabia, supporting Saudi Vision 2030, which promotes technical innovation and advancement in various industries, including accounting and finance. By promoting the adoption of emerging technology, the study contributes to achieving Vision 2030's goals. It offers practical guidance for practitioners and policymakers in incorporating cutting-edge technologies into accounting processes and recommends governance mechanisms to maximize the advantages of AI and other technologies. The findings could improve the effectiveness and capacity of accounting operations, leading to better risk management, financial reporting, and overall organizational success. The study emphasizes the adoption of AI in Saudi accounting and auditing functions, highlighting the crucial role of IT governance. It focuses on the role of AI tools in transforming accounting operations. The findings have several practical, valuable insights for practitioners, policymakers, and researchers, advancing the understanding of AI's effective integration and adoption in accounting operations. IT governance serves as an alignment tool and approach.

This study suggests that accounting and auditing experts can improve their functions by incorporating AI tools, big data analytics, cloud computing, and deep learning approaches. AI may improve efficiency, accuracy, and decision-making powers, automate activities, decrease human error, and provide significant insights from large amounts of data, leading to enhanced audit quality and better services. Policymakers can use data to establish supportive frameworks for innovation and sustainability, including incentives, infrastructure, legal support, and professional development programs. These strategies can accelerate progress, foster a culture of continuous improvement, and ensure long-term economic and social benefits. The current study also educates policymakers and professionals that IT governance facilitates and mitigates these complexities' adverse effects while there is complexity in using AI tools in accounting functions.

Despite the critical findings of the current study, it has certain limitations. First, it is limited to an emerging country, Saudi Arabia, and its global generalizability is restricted due to several factors, including regulations, infrastructure, culture, and specific market dynamics. Future research should look at a broader population from several countries and industries to better understand the variations in AI implementation. Second, the survey could have offered comprehensive insights into the challenges, limitations, and factors determining AI's successful implementation and adoption in accounting and auditing functions. Third, the research should have addressed the unique challenges that small- and medium-sized enterprises (SMEs) encounter when implementing AI technologies. Finally, the influence of AI on the accounting and auditing workforce still needs to be addressed. Thus, a possible stream for future research is the exploration of the challenges that industries and SMEs encounter when implementing AI technologies, including the skills needed for future generations.

Funding: No funding has been provided for this manuscript.

Informed Consent Statement: Not applicable.

Data Availability Statement: Data will be made available upon request.

Conflicts of Interest: The author declares no conflicts of interest.

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