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Lando Francisco The Impact of Emerging Technologies in Accounting and Auditing

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The Impact of Emerging Technologies in Accounting and Auditing

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The Impact of Emerging Technologies in Accounting and Auditing

Dissertation submitted to the Instituto Superior de Contabilidade e Administração de Coimbra – Coimbra Business School in fulfilment of the requirements for the master's degree in Business and Public Auditing, conducted under the supervision of Professor Bruno Almeida.

Coimbra, October 2024

STATEMENT OF RESPONSIBILITY

I hereby declare that I am the author of this dissertation, which constitutes an original and unpublished work, and has never been submitted to any other higher education institution for the attainment of an academic degree or any other qualification. I also certify that all citations are properly referenced, and I am fully aware that plagiarism constitutes a serious ethical violation, which may result in the annulment of this dissertation.

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ABSTRACT

This dissertation explores the adoption, impact, and challenges of emerging technologies—namely Artificial Intelligence (AI), Blockchain, ML, and RPA—in the financial auditing and accounting sector. With technological advances continually redefining the professional landscape, this study aims to provide a comprehensive understanding of how these technologies are being used, the benefits they provide, and the obstacles faced by organizations in implementing them.

The research is guided by several key questions: What is the current level of adoption of these technologies in financial audit and accounting services? What are the main challenges and barriers that companies face during the adoption process? What perceived benefits do these technologies bring in terms of efficiency, scalability and cost reduction? Finally, how do adoption rates and the benefits perceived according to the size of the companies and the roles played within the organization? To answer these questions, a mixed-methods approach was adopted, using a structured questionnaire distributed among professionals in the financial audit and accounting sector. Descriptive statistical techniques, including frequency distributions and cross-tabulations, were applied to analyze the data collected from 29 respondents, providing insights into the extent of technology adoption, perceived impacts, and variations in different organizational contexts.

The results reveal that while technologies such as ML and AI have been widely adopted due to their direct applications in data analysis and process automation, others, such as Blockchain, have yet to achieve significant adoption, possibly due to their perception as a niche technology or their early stage of development. The results also highlight significant challenges, including a lack of expertise, high costs, and regulatory compliance issues, which pose substantial barriers to wider adoption. On the other hand, the perceived benefits, such as greater accuracy, improved efficiency and better risk management, underline the transformative potential of these technologies.

This study adds to the existing body of knowledge by providing empirical evidence on the state of technology adoption in the financial audit and accounting sector and offering practical recommendations to industry players and policy makers. It emphasizes the importance of strategic investments in training, infrastructure, and change management to overcome existing challenges and take full advantage of the advantages provided by emerging technologies.

In conclusion, this dissertation highlights the critical role of emerging technologies in promoting innovation and efficiency in financial auditing and accounting. It calls for continued research into the factors influencing technology adoption and the development of appropriate strategies to support successful integration, ensuring that organisations of all sizes can benefit from the ongoing digital transformation in the industry.

Keywords: Artificial Intelligence, Blockchain, Machine Learning, Robotic Process Automation, Financial Auditing, Accounting, Technological Adoption, Operational Efficiency, Challenges and Benefits.

ÍNDICE GERAL

ÍNDICE DE TABELAS E FIGURAS

List of Abbreviations, Acronyms, and Initialisms

- AI: Artificial Intelligence
- RPA: Robotic Process Automation
- ML: Machine Learning
- DL: Deep Learning
- ERP: Enterprise Resource Planning
- AICPA: American Institute of Certified Public Accountants
- ICAEW: Institute of Chartered Accountants in England and Wales

1 INTRODUCTION

In the rapidly evolving landscape of financial auditing and accounting, the integration of emerging technologies such as Artificial Intelligence (AI), Blockchain, ML, and RPA is becoming increasingly prevalent. These technologies are reshaping traditional practices by enhancing efficiency, improving data accuracy, and reducing operational costs. As the industry continues to adapt to these advancements, there is a growing need to understand the extent of their adoption, the perceived benefits they bring, and the challenges faced by organizations during their implementation.

This study aims to investigate the role and impact of these emerging technologies within the financial auditing and accounting sector. The research questions guiding this inquiry focus on evaluating the current level of adoption, identifying the primary challenges and barriers encountered, and exploring the perceived benefits from different organizational perspectives. Additionally, the study seeks to examine how the adoption rates and perceived benefits of these technologies vary according to the size of the companies and the roles performed within the organizations, understanding these dynamics is crucial for several reasons. Firstly, it provides insights into how companies of different sizes and capacities are approaching technological innovation, particularly in a field where accuracy, compliance, and efficiency are paramount. Secondly, it identifies key obstacles that may hinder broader technology adoption, such as a lack of expertise, high costs, or regulatory concerns. Lastly, it explores the potential advantages that emerging technologies can offer, from enhancing scalability and reducing operational costs to improving overall auditing quality and reliability.

The findings of this research are expected to contribute significantly to the existing body of knowledge by providing empirical evidence on the adoption rates, challenges, and benefits associated with AI, Blockchain, ML, and RPA in financial auditing and accounting. The study will also offer practical recommendations for

industry stakeholders, policymakers, and academic researchers, highlighting the factors that influence successful technology adoption and suggesting strategies for overcoming barriers to implementation.

By addressing these aspects, the research seeks to provide a comprehensive understanding of the current state of technology adoption in the sector, helping organizations to navigate the complexities of digital transformation and maximize the benefits of these powerful tools.

1.1 Objective

The primary objective of this dissertation is to explore the adoption and impact of emerging technologies—specifically AI, Blockchain, ML, and RPA—within the financial auditing and accounting sectors. This study aims to provide a comprehensive understanding of how these technologies are being integrated into auditing and accounting practices, the perceived benefits they bring, and the challenges companies face during their implementation. By doing so, it seeks to contribute to the existing body of knowledge on digital transformation in professional services.

To achieve this, the dissertation will focus on several specific objectives. The first objective is to assess the current level of adoption of AI, Blockchain, ML, and RPA in financial auditing and accounting services. This aims to identify how widespread the use of these technologies is within the industry and which specific applications are most implemented.

Another objective is to identify the primary challenges and barriers faced by companies in adopting these emerging technologies. This involves examining factors such as lack of expertise, high costs, resistance to change, regulatory hurdles, and any organizational constraints that hinder technology adoption.

A further objective is to evaluate the perceived benefits of adopting these technologies in terms of efficiency, scalability, and operational cost reduction. The dissertation will analyze how companies view the advantages of implementing AI, Blockchain, ML, and RPA, focusing on areas such as increased accuracy, faster audit processes, and improved risk management.

Additionally, the dissertation aims to analyze the variations in technology adoption rates and perceived benefits according to company size and the roles of professionals within the organization. This objective seeks to uncover whether different types of organizations (small, medium, or large) and roles (such as partners, managers, and auditors) exhibit distinct patterns of adoption and perception.

Finally, the dissertation will provide recommendations for companies and stakeholders on how to effectively adopt and implement these technologies. Based on the findings, the study will suggest strategies and best practices for overcoming challenges and maximizing the benefits of technology adoption in financial auditing and accounting.

By addressing these objectives, this dissertation seeks to offer valuable insights into the digital transformation of financial auditing and accounting services, ultimately supporting organizations in navigating the complexities of technology integration and enhancing their operational capabilities.

1.2 Methodology

This study adopts a quantitative approach to investigate the adoption and impact of emerging technologies—AI, Blockchain, ML, and RPA—in financial auditing and accounting. Data was collected using a structured questionnaire distributed to professionals within the sector, capturing both quantitative insights on technology adoption, perceived benefits, and challenges. A sample of 50 professionals was targeted, with a final response rate of 58%, representing diverse roles and company sizes.

Quantitative data was analyzed using IBM SPSS Statistics, employing descriptive statistics such as frequency distributions and cross-tabulations to identify patterns and trends. This methodology provides a comprehensive examination of the research objectives, integrating both statistical analysis and contextual insights.

1.3 Dissertation Structure

The research process consists of two main parts, in the first part, there will be a literature review in which will be conducted using scientific articles, books and master's dissertations based on like AI, Blockchain, ML, and RPA in accounting and auditing. This review aims to establish a theoretical framework, explore current knowledge, and understand the applications, benefits, and challenges of these technologies.

In the second part, a questionnaire will be distributed among professionals within the account and auditing sector to gain information regarding these technologies.

2 Literature Review

2.1 Introduction to AI in Accounting and Auditing

AI has become a prominent topic in the fields of accounting and auditing, with increasing discourse around its application and potential benefits. However, despite this growing interest, there remains a lack of consensus on a unified definition of AI. This chapter delves into various definitions, classifications, and applications of AI in accounting and auditing, exploring how these technologies are transforming the industry. We will also examine the challenges and limitations associated with AI adoption and propose areas for future research.

2.2 Definitions and Classifications of Artificial Intelligence

In recent years, the discourse surrounding AI in the realms of accounting and auditing has surged in popularity. Yet, amidst this surge, there exists a fundamental lack of consensus regarding the definition of AI. Martinez, R (2019) proposes a broad, adaptable definition that encompasses the latest strides in autonomous AI, suggesting its applicability across various domains. However, Haenlein *et al.* (2019, as cited in Zemánková, 2019) take a more focused stance, defining AI as the adeptness of a system to comprehend external data, learn from it, and employ gleaned insights to achieve specific objectives through flexible adaptation.

(Borges et al. 2021), on the other hand, presents a different perspective. They define Artificial Intelligence as the behavior of machines learning from experiences and adapting to their environment to simulate human intelligence in decision-making and rational processes. This definition contrasts with the notion put forth by Chukwudi et al. (2018), who emphasize AI's ability to undertake tasks traditionally within the purview of human cognition.

AI can be classified into three types of learning: supervised, unsupervised, and reinforcement (Ma and Sun, 2020; Nguyen *et al*. 2019).

According to the authors, depending on the characteristics of the data to be analysed, one or more types of algorithms may be indicated and used.

Nguyen *et al*. (2019) and PwC suggest that supervised learning is used when the data is known and labelled, while unsupervised learning is recommended for situations where the data is unknown or unlabeled, aiming to discover unknown patterns and behaviors. On the other hand, reinforcement learning defines how AI interacts with the environment and learns from it to select appropriate actions according to the situation and maximize responses. Essentially, algorithms learn through trial and error until they achieve the appropriate responses, allowing AI to learn and evolve, making its responses increasingly accurate Nguyen *et al.*, 2019).

Additionally, Artificial Intelligence can be categorized into three groups: Analytical AI, Human-Inspired AI, and Humanized AI. Analytical AI possesses only cognitive characteristics and based on past experiences, can provide insights into future decisions. Solutions for this type of Artificial Intelligence are more specialized and focused on specific issues and problems. The majority of current Artificial Intelligence systems fall into this classification. Human-inspired AI, on the other hand, is defined as cognitive systems capable of understanding human emotions, such as expressions of surprise, sadness, and happiness, among others. Finally, Humanized AI refers to complete, cognitive, interpretive, social systems that can have self-awareness and learning of their own and do not yet exist (Kaplan *et al.* 2019).

2.3 AI's Application in Accounting and Auditing

Chukwuani *et al.* (2020) have emphasized the significant progress made in automating routine tasks in accounting and auditing, such as data entry and account reconciliation, allowing accounting and auditing professionals to shift their focus towards more strategic and analytical activities. Conversely, Lee *et al.* (2020) have noted that the adoption of AI is not exclusive to large corporations but is also being embraced by smaller organizations to automate processes that were previously reliant on manual labor, such as invoice data capture.

Nonetheless, not all studies present entirely positive outcomes. Baldwin *et al.* (2006), for instance, have highlighted that many efforts to develop AI-based systems to support auditing tasks are still in the theoretical phase of development. This indicates that, despite significant advancements, there are substantial obstacles to overcome before AI can be fully integrated into audit practice effectively and reliably. Moreover, the literature review has identified a range of AI methods and techniques utilized in accounting and auditing, including neural networks, expert systems, genetic algorithms, and fuzzy neural networks, among others. This diversity of approaches underscores the complexity of the field and emphasizes the necessity of a multifaceted strategy to address the challenges and capitalize on the opportunities presented by AI.

However, despite promising progress, studies have also pointed out persistent challenges, such as a lack of collaboration among various stakeholders, a shortage of essential skills required for the effective implementation of AI, and concerns regarding the reliability and interpretability of AI systems. These challenges underscore the importance of a comprehensive and collaborative approach to tackling the intricate issues arising from the convergence of AI, accounting, and auditing.

Davenport *et al.* (2018) argue that organizations should prioritize AI in terms of business capabilities rather than technological competencies, emphasizing its potential to automate operations, analyze data, and enhance connections with stakeholders.

Chukwuani *et al.* (2020), however, present a contrasting perspective in their research on the auditing sector. They suggest that AI adoption in automating accounting procedures may not necessarily align with broader business capabilities as proposed by Davenport *et al.* (2018).

Furthermore, they discuss the evolving role of accountants in the era of automation, highlighting potential challenges and necessary adaptations in the profession. Lee *et al.* (2020) conducted a study on Malaysian organizations and found that AI adoption is not exclusive to large enterprises, contrary to the assertion made by Davenport *et al.* (2018).

Their research also revealed the use of AI-based auditing software for automating information capture processes, indicating a wider adoption of AI technologies beyond initial expectations.

2.4 Focus Areas of AI in Accounting and Auditing

2.4.1 Enterprise Resource Planning (ERP) Systems

The adoption of Enterprise Resource Planning (ERP) systems has revolutionized accounting practices by enhancing data accessibility, processing speed, and overall efficiency. These systems streamline financial reporting, empower professionals to focus on strategic analysis, and strengthen compliance and governance standards. In essence, ERP technology represents a transformative milestone in accounting, driving organizational success in a dynamic business landscape (Kanellou *et al.* 2013).

2.4.2 Robotic Process Automation

The examination and administration of this extensive big data capacity can benefit from various technologies, among them RPA. Through the automation of tasks and processes, RPA can assist in comprehending and harnessing these vast volumes of data by transforming mundane and repetitive tasks into straightforward activities.

RPA, as defined by PwC (2017), constitutes a form of intelligent process automation (IPA) characterized by logic-driven robots adhering to pre- programmed directives and primarily handling structured data.

The most important aspect of this technology is that it can facilitate the automation of simple structured tasks that require workflow improvements and time optimization (Zhang, 2019), such as balance reconciliations, internal control tests, or detailed testing; it can also facilitate the development of these tests by extracting information from audit samples. The potential of this technology is not only based on the execution of routine tasks, but when combined with AI (RPA + AI = Intelligent Process Automation), it can optimize multiple processes that artificial intelligence identifies as susceptible to improvements (Marshall and Lambert,2018), making it applicable to any auditing process and task.

Given that RPA's fundamental focus is on structured tasks and AI's focus is on facilitating the interpretation of semi-structured or unstructured tasks, the combination of the two can generate significant results in optimizing and streamlining audit processes. Zhang (2019) states that out of 100% of audit tasks, 39% are structured, and the remainder (61%) are semi-structured or unstructured.

2.4.3 Blockchain

During the information analysis processes, one of the risks auditors must consider is the quality of the audited information, especially regarding how the information has been collected, auditors must also consider that errors or manipulation of information can occur in any of the financial information presentation processes. To mitigate this risk, blockchain can be presented as a solution, as it is a system that allows tracking of each transaction, ensuring that there is no manipulation. With blockchain, information is shared peer-to-peer without the intervention of a central authority (Wang *et al.* 2018).

According to the Institute of Chartered Accountants in England and Wales (ICAEW) (2018), blockchain is defined as a real-time ledger system; moreover, it is a transaction ledger, where each transaction has a unique identifier and utilizes technology that allows encryption and decryption of information communicated through the transaction (American Institute of Certified Public Accountants [AICPA], 2018).

It Is considered as a digital ledger that collects real-time information from various parts of the same network, composed of transactions that cannot be eliminated or modified (American Institute of Certified Public Accountants [AICPA], 2018).Auditing can be supported with the use of blockchain because some activities can be eliminated, such as account reconciliation, and procedures that can be considered self-audited, which generates greater confidence and tranquility in decision-making (ICAEW, 2018).

2.4.4 Deep Learning Machine learning

AI is developed from algorithms and the data required to train these algorithms. The data typically consists of observable data, publicly available data, or data generated within some companies; the algorithms iterate over this data to learn from it.

The concept of learning is crucial in this technology as it paves the way for the deployment of ML and DL. Raschke *et al*. (2018) agree that artificial intelligence is a broad category of computerized activities that also encompasses the subsets of machine learning and deep learning. Understanding ML and DL requires grasping a significant enabler such as Natural Language Processing (NLP), which helps AI

understand and analyze unstructured data from various unconventional sources, such as voice recordings, videos, and images (*Raschke et al.* 2018).

Opposite of AI, we have solid definitions, according to (Munoko *et al*. 2020) Machine Learning is the practice of using algorithms to analyze advanced data, learn underlying patterns, and apply the learned data pattern or trend to make predictions on the other hand, Dis an advanced technique of machine learning that relies on artificial neural networks to abstract features from data by gathering knowledge and extracting patterns from raw data (Raschke *et al*. (2019).

2.5 Case Studies: AI Use by Big 4 Firms

According to Griffin (2019), small businesses that do not adapt to changing times run the risk of being left behind. As technology has eventually caught up with accounting, it is now essential for organizations of all sizes to keep up with technology trends in order to stay competitive. Examining the Big 4 accounting firms' use of AI technologies unfolds two distinct tendencies. Firstly, the accounting profession is progressively investing in AI and its integration into core business. Secondly, the Big 4 assert that AI is a critical determinant for future accounting success (Zhang *et al.* 2020).

In March 2016, Deloitte collaborated with Kira Systems to introduce innovation and machine learning into the workplace, the partnership led to the development of Argus, a cognitive tool tailored for auditing purposes (Ucoglu, 2020).On the other hand, EY has developed the Helix GL Anomaly Detector (GLAD), a tool capable of using algorithms to detect fraudulent journal entries and provide explanations for such detections (Ucoglu, 2020; Zemánková, 2019). Machine learning technology is also leveraged by EY to enhance fraud detection, resulting in a 97 per cent accuracy rate in identifying questionable invoices through their Fraud Investigation and Dispute Service (FIDS).

Furthermore, with H2O.ai, a Silicon Valley firm, PwC has developed the GL.ai robot, integrating AI technology into accounting practices. GL.ai leverages ML to assimilate PwC's global knowledge and experience, mimicking the decision-making process of experienced auditors (Zhang *et al.* 2020).

Additionally, PwC has introduced Cash.ai, an automated tool for cash audits encompassing cash balances, bank reconciliations, bank confirmation letters, foreign exchange, and overall financial health assessment of banks (Zemánková, 2019).

Moreover, KPMG has developed the K-analyzer, a tax analytics program leveraging RPA technology for rapid assessment of thousands of transactions (Zhang *et al.* 2020). Additionally, KPMG utilizes tools like the Payroll Tax Automator, Automatic Exchange of Information (AEOI) reporting tool, and FBT Automator to streamline various tax-related processes.

2.6 Benefits and Challenges of Implementing AI in Accounting and Auditing

2.6.1 Benefits

Before delving into the benefits of implementing AI in Accounting and Auditing, it's crucial to acknowledge the growing recognition among scholars and industry experts regarding the transformative potential of artificial intelligence in both practices. Chukwuani and Egiyi (2020) advocate for the integration of AI, highlighting its capacity to mitigate fraud risks, elevate accounting data quality, and revolutionize conventional auditing methodologies. Similarly, Mohammad *et al.* (2020) emphasizes the importance of staying abreast of AI advancements in accounting and auditing, citing cost reduction and enhanced value generation through data-driven decision-making as key incentives.

Additionally, Makridakis (2017) underscores the strategic advantage awaiting early adopters of AI, suggesting that embracing innovative technologies can propel businesses towards unprecedented global success.

2.6.2 Challenges

Contrary to the numerous benefits AI brings to accounting and auditing, several insufficiencies and challenges warrant consideration. Bizarro and Dorian (2017) caution against over-reliance on AI, emphasizing that while it enhances efficiency, it cannot supplant essential human faculties such as critical thinking and emotional intelligence. They also warn of the looming spectre of "technological unemployment." Echoing these concerns,

Kumar Doshi et al. (2020) underscores the dual nature of AI's impact, acknowledging its potential for opportunity creation while acknowledging its capacity to render certain professions obsolete. Agnew (2016), as cited in Kokina and Davenport (2017), highlights the potential disruption AI poses to employment paradigms, with forecasts indicating a decline in new job opportunities due to technological advancements.

Luo et al. (2018) identified various challenges confronting AI integration in accounting, including initial inexperience, slow returns on investment, and the imperative for professionals to cultivate new skills and competencies. Additionally, Huang (2018) notes the hurdle of frequent legislative and regulatory changes necessitating continual updates to AI systems, particularly concerning tax laws. Zemánková (2019) voices concerns about the potential socioeconomic ramifications of AI adoption, including income inequality, diminished labor demand, and compromised financial stability.

Moreover, there's a risk of AI algorithms perpetuating biases, deceit, or errors, as cautioned by Makridakis (2017), potentially exacerbating unemployment, wealth disparities, and existential threats to human dominance. Mohammad et al. (2020) further highlights the formidable challenges in AI adoption, underscoring the imperative for effective strategic frameworks, adept workforce mobilization, and unwavering leadership commitment.

3 Definition of Research Questions and Study Objective

The objective of this study is to investigate the role and impact of emerging technologies — mainly AI, Blockchain, ML, and RPA in financial auditing and accounting services. The research questions have been defined based on the need to understand the level of adoption of these technologies, the perceived benefits, the challenges faced by companies during the implementation process, and the variations in adoption and perception of benefits according to the size and roles within the organizations.

Thus, this study aims to answer the following research questions:

1. To what extent are emerging technologies, such as AI, Blockchain, ML, and RPA, currently being adopted by small, medium, and large firms in the financial auditing and accounting sectors?
   This question aims to evaluate the current level of adoption of these technologies in companies' auditing and accounting practices.

2. What are the primary challenges and barriers faced by companies when adopting AI, ML, Blockchain and RPA in financial auditing and accounting sector? This question seeks to identify specific difficulties and obstacles, such as a lack of expertise, high costs, resistance to change, and regulatory issues, that companies face during the implementation process.

3. What are the perceived benefits of adopting emerging technologies in financial auditing and accounting in terms of efficiency, scalability, and operational cost reduction?
   The third research question aims to explore the advantages perceived by companies adopting these technologies, focusing on improving efficiency, process scalability, and reducing operational costs.

4. How do the adoption rates and perceived benefits of emerging technologies in financial auditing and accounting vary according to the size of the companies and the roles performed within the organization?
   This question intends to analyse whether and how company characteristics, such as size and organizational role, influence the adoption and perceived benefits of these technologies.

The study, therefore, aims to analyze how emerging technologies are being adopted by companies in the financial auditing and accounting sector, what the main obstacles encountered in this process are, and what the perceived benefits are, considering the variations according to company size and roles performed. By answering these the research aims to provide a comprehensive understanding of the current state of the adoption of emerging technologies in the sector, as well as identify factors that may support or hinder this adoption.

3.1 Methodology

This research adopts a exploratory quantitative approach due to the innovative nature of the topic and the limited existing research on this subject. Quantitative methods are particularly valuable for examining complex social phenomena and understanding how individuals interpret and respond to them. In this context, exploring the impact of emerging technologies on financial auditing and accounting is essential, as innovation in this sector is crucial for its development and competitiveness.

3.2 Data Collection and Sample

The data for this research was collected through a carefully designed questionnaire distributed to professionals within the financial audit and accounting industry,the questionnaire included closed-ended questions for precise, quantifiable responses and Likert scale questions to gauge perceptions regarding the ease of use and usefulness of these technologies.

The electronic questionnaire was administered through Google Forms and was available for a period of 30 days. While electronic surveys are not inherently confidential, careful measures were taken in place to ensure confidentiality throughout the process to enhance participation rates, two reminders were sent via Google Forms, encouraging respondents to complete the survey.

The sample size for this study was determined to ensure representativeness and reliability. A total of 50 questionnaires were initially distributed. The decision on the sample size was guided by the need to achieve a 95% confidence level and a 10% margin of error. The 95% confidence level means that we can be 95% certain that the findings from our sample reflect the characteristics of the entire population, while the 10% margin of error accounts for reasonable variability within the data. This margin of error was considered appropriate for an exploratory study where the objective is to identify trends and patterns rather than to make precise estimates. Additionally, practical constraints, such as time and resources, influenced the decision to distribute 50 questionnaires, which was sufficient given the anticipated response rates in professional settings.

To ensure representativeness, a stratified sampling approach was employed based on two key characteristics: organization size and professional roles. This method was chosen to capture the diversity of firms in the industry and the range of perspectives on technology adoption. The organization size was stratified into three categories: small firms (2-10 employees), medium firms (11-50 employees), and large firms (51 or more employees). The professional roles were stratified into four categories: partners, managers, senior auditors/accountants, and junior auditors/accountants.

3.2.1 Justification for Stratification

Organization Size: Different firm sizes may have varying capabilities and resources, which can affect the adoption and implementation of new technologies. For example, larger firms (51 or more employees) might have more financial and human resources to invest in advanced technologies compared to smaller firms (2- 10 employees).

Professional Roles: Different roles within firms may have different levels of influence and perspectives on the adoption and use of technologies like AI, Blockchain, ML, and RPA. For example, partners might focus on strategic benefits, managers on operational efficiency, and auditors (both senior and junior) on practical implementation and regulatory compliance.

3.2.2 Relative Data on Population and Sample:

- Population Distribution:

Organization Size: Small firms (2-10 employees) (60%), Medium firms (11-50 employees) (30%), Large firms (51 or more employees) (10%).

Professional Roles: Partners (20%), Managers (30%), Senior Auditors/Accountants (25%), Junior Auditors/Accountants (25%).

- Sample Distribution:

Organization Size: Small firms (2-10 employees) (58%), Medium firms (11-50 employees) (32%), Large firms (51 or more employees) (10%).

Professional Roles: Partners (18%), Managers (32%), Senior Auditors/Accountants (27%), Junior Auditors/Accountants (23%).

A total of 29 responses were obtained from the questionnaire, these distributions demonstrate that the sample closely mirrors the population in terms of organization size and professional roles, ensuring the sample's representativeness. The similarity between the population and sample distributions indicates that the sampling approach effectively captured the diversity within the industry.

Pretesting was conducted with a few professionals to refine the questionnaire, ensuring clarity and relevance, and compliance with ethical guidelines. The data was securely stored and was only accessed by the research team, with no identifiers used. IBM SPSS Statistics was used for data analysis, focusing on descriptive statistical to align with the exploratory objectives of this research and the data collected.

3.3 Analytical Method

This section describes the method used to analyze the data collected from the questionnaire distributed to professionals in the financial auditing and accounting industry. The data were analyzed using IBM SPSS Statistics software, employing various descriptive statistical techniques to summarize and interpret the findings.

IBM SPSS Statistics was chosen for the data analysis due to its robust statistical capabilities, user-friendly interface, and widespread acceptance in academic research. This software enabled a comprehensive range of descriptive statistical analyses, allowing for the effective summarization and exploration of the collected data,given the exploratory nature of this study, the primary focus was on descriptive statistics.

Frequency distributions were calculated to determine the number and percentage of respondents who reported adopting each technology—AI, Blockchain, ML, and RPA—in their auditing and accounting practices, this approach provided an overview of the prevalence of each technology across the surveyed organizations. The frequencies were calculated for each categorical variable, and percentages were derived to represent the relative distribution of responses. This was aimed at offering a clear understanding of the current adoption rates of emerging technologies and identifying which technologies are most and least adopted within the industry.

Cross-tabulations were performed to analyze the relationship between different categorical variables, such as company size (small: 2-10 employees, medium: 11-50 employees, large: 51 or more employees) and professional roles (partner, manager, senior auditor/accountant, junior auditor/accountant), with the adoption rates and perceived benefits of the technologies. This method allowed for the identification of patterns and differences in technology adoption across various segments of the population by exploring how the adoption of emerging technologies varies according to company characteristics and professional roles. Insights were gained into the factors influencing technology uptake.

Mean scores were calculated for responses to Likert scale questions that assessed perceptions of ease of use, usefulness, efficiency, scalability, and cost reduction associated with the adoption of each technology. Additional measures of central tendency, such as

median and mode, were computed to provide a comprehensive summary of the data. This helped quantify the average level of agreement or perception among respondents regarding the benefits and challenges of adopting emerging technologies, allowing for a comparison of overall sentiment across different technologies and respondent groups.

The application of these descriptive statistical techniques enabled a detailed examination of the collected data. The results were interpreted to draw meaningful conclusions about the current landscape of emerging technology adoption in the financial auditing and accounting industry. The interpretation focused on identifying key trends, patterns, and differences observed in the data, highlighting the most widely adopted technologies, common challenges and barriers, perceived benefits, and variations in adoption rates based on company size and professional roles.

4 Results and Discussion

This chapter presents the detailed results of the descriptive analysis conducted on the questionnaire data and offers a comprehensive discussion of the key findings. The study aims to shed light on the adoption levels of emerging technologies, the perceived impacts, the challenges encountered, the benefits observed, and the variations in these factors across different organizational contexts within the financial auditing and accounting sector.

The analysis leveraged IBM SPSS Statistics software to perform various descriptive statistical techniques, including frequency distributions, cross-tabulations, and the calculation of mean scores. These methods provided an in-depth examination of the data, allowing for a nuanced understanding of how emerging technologies are perceived and utilized across different organizational environments.

4.1 Adoption of Emerging Technologies

The adoption of emerging technologies such as AI, Blockchain, ML, and RPA was first assessed using frequency distributions to quantify the extent to which these technologies are being implemented by companies in the financial auditing and accounting industry.

The results indicate that ML is the most widely adopted technology, with 62.1% of respondents reporting its use, followed by Artificial Intelligence (AI), adopted by 51.7% of respondents. Blockchain lags significantly behind, with only 34.5% adoption. This distribution suggests that while some technologies, like ML and AI, have been embraced more rapidly due to their direct applications in data analytics and process automation, others, such as Blockchain, may still be perceived as niche or not yet fully adapted to the specific needs of financial auditing.

Furthermore, the data reveals that 17.2% of the companies surveyed are not currently using any of these emerging technologies. This finding indicates a considerable proportion of firms that may either lack awareness, resources, or motivation to adopt these technologies, or that may face unique challenges inhibiting their adoption.

To further investigate adoption patterns, cross-tabulations were conducted to compare the adoption rates by company size and professional roles. The analysis shows a distinct trend: larger firms (those with 51 or more employees) exhibit an adoption rate of 80%, which is notably higher than medium-sized firms (11-50 employees) at 60%, and small firms (2-10 employees) at 40%. These results suggest that larger firms, likely due to their greater financial and human resources, are better positioned to invest in and deploy emerging technologies.

The higher adoption rates in larger firms underscore the resource-based view in organizational theory, which posits that firms with more resources are better equipped to leverage new technologies for competitive advantage.

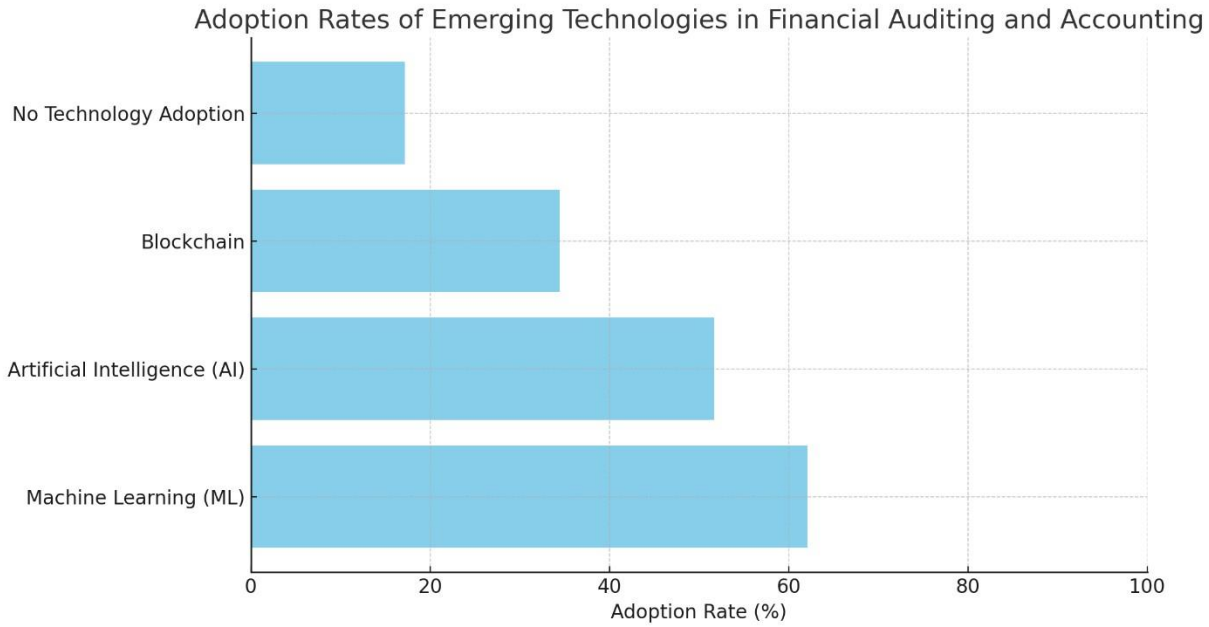

Figure 1-Technology Adoption Rates

4.2 Challenges and Barriers in Adopting Emerging Technologies

Identifying the challenges and barriers faced by companies in adopting these technologies is crucial for understanding the landscape of technology integration in financial auditing and accounting. Frequency distributions were employed to identify the primary challenges cited by respondents.

The most significant barriers reported include a lack of expertise (69.0%), high costs (62.1%), data privacy concerns (51.7%), regulatory compliance issues (41.4%), and integration with existing systems (34.5%). These results suggest that human capital and financial constraints are the most pressing challenges for firms attempting to adopt new technologies. The lack of expertise, in particular, indicates a skills gap in the workforce, which could hinder effective adoption and use of these technologies.

The prominence of data privacy concerns and regulatory compliance challenges reflects the unique context of the financial auditing sector, where data sensitivity and regulatory scrutiny are particularly high. These findings underscore the need for a more robust framework that addresses both the skills gap and regulatory challenges to facilitate broader adoption of emerging technologies.

Challenge / Barrier	Percentage of Respondents (%)
Lack of Expertise	69.0%
High Costs	62.1%
Data Privacy Concerns	51.7 %
Regulatory Compliance Issues	41.4%
Integration with Existing system	34.5%

Table 1-Table 1: Challenges and Barriers to Technology Adoption

4.3 Perceived Benefits of Adopting Emerging Technologies

The exploration of the perceived benefits of adopting emerging technologies in financial auditing and accounting was based on an analysis of responses from professionals actively engaged in these fields. The analysis reveals that the most frequently cited benefits include enhanced accuracy (reported by 75.9% of respondents) and increased efficiency in handling routine tasks (69.0%). This suggests that the integration of technologies such as AI, ML, and RPA is primarily seen to improve the precision and effectiveness of auditing processes, by minimizing human error and automating repetitive activities.

Other notable benefits highlighted by respondents include faster audit processes (62.1%), which implies a reduction in the time required to complete audits, and better risk management (55.2%), reflecting an enhanced ability to identify and mitigate potential financial discrepancies or fraud. Additionally, the adoption of these technologies is seen to contribute to cost reduction (48.3%) and improved compliance (34.5%), underscoring their role in lowering operational expenses and ensuring adherence to evolving regulatory standards.

These findings align with existing research that emphasizes the critical role of technology adoption in enhancing the efficiency and accuracy of financial auditing tasks. By reducing the manual workload associated with traditional auditing methods, these technologies enable firms to reallocate resources towards more strategic activities, such as risk assessment and advisory services, ultimately creating a more value-added service proposition for clients.

The observed benefits support the theoretical framework of the resource-based view (RBV), which posits that firms adopt new technologies primarily to develop and sustain competitive advantages. In this context, the adoption of emerging technologies can be seen as a strategic initiative to build distinctive capabilities that enhance operational efficiency, improve service delivery, and support long-term growth.

Benefit	% of Respondents
Enhanced Accuracy	75.9%
Increased Efficiency in Tasks	69.0%
Faster Audit Processes	62.1%
Better Risk Management	55.2%
Cost Reduction	48.3%
Improved Compliance	34.5%

Table 2-Perceived Benefits of Adopting Emerging Technologies

4.4 Variations in Adoption and Perceived Benefits by Company Size and Role

To gain further insights into how different types of organizations perceive and benefit from the adoption of these technologies, the analysis examined variations in adoption rates and perceived benefits by company size and professional roles. The results indicate that larger companies (defined as those with 51 or more employees) report a significantly higher rate of technology adoption (80%) compared to medium-sized companies (11-50 employees) at 60%, and small companies (2-10 employees) at 40%.

This variation suggests that larger companies are better positioned to integrate these technologies, likely due to their greater access to financial and human resources. Larger firms typically have more capital to invest in technology infrastructure, training, and development, which enables them to overcome barriers that smaller firms may find prohibitive. Moreover, larger firms often have a more diversified workforce, including dedicated IT and digital transformation teams, which facilitates the adoption and integration of new technologies into existing processes.

In contrast, smaller firms may face more significant challenges in adopting these technologies. Limited financial resources, a lack of specialized expertise, and a smaller operational scale can make it more difficult for these organizations to invest in and sustain new technologies. Furthermore, the perceived benefits of technology adoption, such as cost reduction and enhanced risk management, may not be as pronounced in smaller firms, where the scale of operations may not justify the initial investment costs.

When considering the perceived benefits across different professional roles within organizations, the analysis shows that partners and managers tend to perceive greater strategic and operational benefits from adopting these technologies compared to auditors and accountants. For example, partners and managers are more likely to focus on the long-

term strategic value of technology adoption, such as improving client satisfaction, enhancing firm reputation, and driving business growth. On the other hand, auditors and accountants may place more emphasis on immediate operational benefits, such as increased accuracy and efficiency in audit processes.

These findings highlight the importance of understanding the diverse perspectives within organizations regarding technology adoption. They suggest that effective technology implementation strategies should consider the specific needs and priorities of different stakeholders, tailoring communication and training efforts accordingly. For instance, providing comprehensive training programs for auditors and accountants on how to use new technologies effectively could help mitigate resistance to change and enhance overall adoption rates.

Company Size	Adoption Rate (%)
Small Firms (2-10 employees)	40%
Medium Firms (11-50 employees)	60%
Large Firms (51+ employees)	80%

Table 3 :Technology Adoption Rates by Company Size

5 Discussion

The findings from this study provide a nuanced understanding of the adoption landscape of emerging technologies in financial auditing and accounting. The high adoption rates of technologies such as Machine Learning and AI reflect their perceived utility in enhancing analytical capabilities, automating complex tasks, and improving decision-making processes. These technologies are seen as directly beneficial in managing large volumes of data, identifying patterns and anomalies, and supporting the overall audit function with advanced predictive and prescriptive analytics.

Conversely, the relatively lower adoption rates of Blockchain technology suggest that its perceived value in this sector remains less clear. Blockchain's applications in financial auditing, such as real-time transaction tracking and enhanced data security, are still in the early stages of exploration. This finding indicates that while there is interest in Blockchain's potential, the current state of the technology and its alignment with specific auditing needs may require further development and adaptation.

The challenges identified, particularly the lack of expertise and high implementation costs, underscore the need for a strategic approach to technology adoption. Investment in training and capacity-building initiatives is critical, especially for smaller firms that may lack the necessary resources to navigate the complexities of digital transformation. Additionally, the regulatory and data privacy concerns highlighted by respondents reflect the unique challenges faced by the financial auditing sector, which operates under strict compliance requirements and handles sensitive client data.

To address these barriers, firms may need to adopt a more collaborative approach, engaging with industry bodies, technology providers, and regulatory authorities to develop frameworks that facilitate the safe and effective use of these technologies. Moreover, fostering a culture of continuous learning and innovation within organizations can help build the necessary competencies and mindsets to embrace technological change.

The variations in adoption rates and perceived benefits by company size and role also underscore the importance of tailoring technology adoption strategies to the specific characteristics and needs of different firms. Larger firms, with their greater resource base, may focus on comprehensive digital transformation initiatives, while smaller firms might benefit from targeted support measures, such as government incentives, partnerships with larger firms, or shared technology platforms.

6 Conclusion

The research offers an in-depth investigation of the usage of the using AI, ML, Blockchain, and RPA as one of the main new technologies in the financial auditing and accounting industry. After viewing the present scene, the study enunciates main adopting directions, perceived advancements, problems, and differences from the size point of view and professional roles.

The results exhibit not only that the AI and ML technologies are universally adopted because of their high capabilities in terms of data analysis, engaging task automation, and also decision-making quality but the Blockchain is quite behind in the technology adoption process. It implies that though the technologies such as AI and ML are very well suited to the industry's demands, some others may not be fully formed and thus will need more enhancement to meet the sector's requirements properly. The study also stresses the critical role of these technologies in achieving efficiencies, scalability, and operations cost minimization, especially in bigger firms where the possibility of technology investment is high. Actually, many of the companies, particularly start-ups, are run against such obstacles like high costs, lack of knowledge, and challenges in regulation, which in turn has an adverse impact on their implementation of these technologies. These blockades cast light on the necessity to concentrate on a solid strategy that can give the necessary support for the smaller outfits such as focused training, capacity building, and financial incentives.

In addition to that, data privacy issues and regulatory concerns are still seriously mentioned, this points out that the sector is cool enough about the money safety and the need of the compliance with the measures. Moreover, the study also reveals a crucial variety of technology adoption and perceived benefits across various company sizes as well as roles. The larger companies are more favourable to newly introduced technologies with faster adoption, which is one of the attributes of the financial and human resources that they have.

The smaller companies nevertheless face more budget constraints and as such, they need tailor-made technical support to unify these details, the same is true of the differences between the strategic thinking of the managers and the partners and the operational improvements that the accountants and auditors concentrate on. The adoption strategies are most likely to be successful if they address the diverse requirements of every stakeholder in the company in the organization, it can be derived that the implications of this study contribute substantially to the existing knowledge base of technology adoption in the financial auditing and accounting industry. Another way to gain more widespread and effective use of new technologies would be to cope with the expenses of these barriers like the cost, the expertise, and the regulation. The industry can only overcome these challenges through a joint approach involving the government, the regulators, and the technology providers, furthermore, the introduction of a company culture based on learning and innovation will also help firms to adjust better to new technologies and so better to develop and maintain their competitive status in the digital world.

6.1 Study Limitations

This study has provided meaningful insights into the level of adoption and perceived benefits of emerging technologies in financial auditing and accounting. However, several limitations are recognized that could impact the generalizability and robustness of the findings.

First, the sample size of 29 respondents is relatively small, which limits the statistical power of the results and their generalization to a broader population. A larger and more diverse sample would likely improve the reliability of the findings. Although the study achieved a response rate of 58%, there remains a concern about non-response bias; it is possible that those who chose to participate differ substantially from those who did not, which could skew the results.

Additionally, the reliance on self-reported data collected through questionnaires introduces the potential for response bias. Participants may have overstated or understated their level of technology adoption, maturity, or perceived benefits, due to social desirability bias or misunderstanding of the questions. The cross-sectional design of this study also limits the ability to observe changes in technology adoption over time, offering only a snapshot of the current situation. This limitation means that the study may not fully represent the population across different firm sizes, regions, or organizational contexts, as it focused on a specific subset of these factors. Furthermore, the study did not explore organizational and geographical factors in detail, even though these factors likely have a significant impact on technology adoption.

6.2 Future Research Directions

To address these limitations, future research should consider the following areas for improvement:

- **Expand the Sample Size and Representativeness**: Future studies should increase the sample size and enhance representativeness by including a broader array of participants from different types of organizations, regions, and industries. This would help improve the generalizability and reliability of the findings.
- **Adopt a Longitudinal Research Design**: Implementing a longitudinal design would enable researchers to track technology adoption, maturity, and perceived benefits over time, providing deeper insights into how these variables evolve. This approach would help understand the dynamics of technology adoption in financial auditing and accounting more comprehensively.
- **Explore Organizational Culture, Leadership, and Change Management**: Investigating the role of organizational culture, leadership, and change management in technology adoption can provide valuable insights into the factors contributing to the success or failure of technology initiatives. Understanding these internal factors could help organizations better prepare for technological transformations.
- **Examine Technology Adoption Across Different Industries**: Expanding research to compare technology adoption across various industries would identify whether the challenges and benefits observed in accounting, auditing, and finance are unique or shared with other sectors. This could reveal broader patterns and lessons that are applicable across industries.
- **Analyze the Impact of Regulatory Environments**: Future research should also consider how the nature of regulatory environments shapes the adoption and implementation of technologies within the financial sector. This would provide a clearer understanding of how external pressures and constraints influence technological decisions.

- **Quantify the Return on Investment (ROI) of Financial Technologies**: To provide a more precise assessment of the impact of emerging technologies, future studies should quantify the actual return on investment through metrics such as revenue growth, cost savings, and overall performance improvements. This would offer a better view of the financial benefits and justify the adoption of these technologies.

- **Fill the Gaps of AI in Auditing Research:** As AI in auditing is still nascent, the current literature primarily focuses on conceptual understanding, use cases, and potential impacts. Although some studies have looked at AI implementation in specific industries and countries, there is a notable gap in exploring the determinants of AI implementation and its correlation with firm performance or efficiency. The lack of studies is due to the limited widespread adoption of AI applications in accounting and auditing.

- **Prioritize Case Study Investigations:** future research should also conduct more case studies that show the successes and failures of organizations, particularly in developed countries that are adopting AI-based solutions. Sharing these insights with stakeholders could foster greater awareness and potentially drive wider adoption of AI in accounting and auditing.

By addressing these areas, future research can build on the findings of this study and provide a more comprehensive understanding of the role and impact of emerging technologies in financial auditing and accounting.

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APÊNDICES

APÊNDICE 1. QUESTIONNAIRE

Questões:
Demographic Information
1.Type of Firm
2.Your Role in the Firm
Current Use and Maturity Level of Emerging Technologies
3.Does your firm currently use any of the following technologies in financial auditing and accounting services?
4.If yes, how would you rate the maturity level of these technologies within your firm on a scale of 1 to 7, where 1 is the lowest and 7 is the highest?
5.What are the primary limitations faced by your firm in implementing these technologies?
6.What are the main challenges your firm encounters in the implementation process?
7.What concerns does your firm have regarding the use of these technologies in financial auditing and accounting services?
8. What potential benefits has your firm experienced from using these technologies in financial auditing and accounting services?
9.How would you rate the overall impact of these technologies on your firm's financial auditing and accounting capabilities?
10.Based on your experience, how likely is your firm to continue investing in these technologies for financial auditing and accounting in the next 3-5 years?

11.Which of these technologies do you believe holds the most promise for the future of financial auditing and accounting services?
12.What additional support or resources would help your firm better implement these technologies?