THE IMPACT OF ARTIFICIAL INTELLIGENCE ON FORENSIC ACCOUNTING PRACTICES IN CANADA: EXAMINING THE ADOPTION AND UTILIZATION OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN FORENSIC ACCOUNTING PRACTICES AND THEIR IMPLICATIONS FOR EFFICIENCY AND EFFECTIVENESS

Research Project for Emerging Issues/Advanced Topics

Master of Forensic Accounting (MFAcc) Program

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MAY 31, 2024

FOR: PROF LEONARD BROOKS

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ACKNOWLEDGMENTS

I wish to take a few moments to express my profound gratitude to certain people, for this program would not have been conceivable without them.

Firstly, I want to thank my instructors in the MFAcc program, for their dedicated hours of instruction during the program.

I would also like to thank my employer(CLFN) for giving me the time to complete this program. Also am grateful to my friends and peers, especially my team members in Group 5 (The Fraudbusters) for their friendliness and contributions during the group assignments.

Finally, my heartfelt thanks go to my family, my wife (Jossy), daughter (Temi), and son (Timi) for their love, patience, and encouragement. Your unwavering belief in me has been my greatest strength.

To anyone I may have inadvertently overlooked, please accept my sincere thanks.

Executive Summary

The integration of Artificial Intelligence (AI) techniques into Forensic Accounting practices presents a significant paradigm shift in financial investigations. This research delves into the impact of Artificial Intelligence on Forensic Accounting practices in Canada, aiming to examine the adoption, utilization, and implications of AI technologies within this specialized domain.

The study's objectives encompass assessing the current state of AI adoption in Forensic Accounting, exploring its impact on efficiency and effectiveness, examining ethical considerations, understanding professional development needs, and providing recommendations for AI integration. These objectives are crucial for adapting Forensic Accounting practices to remain relevant, efficient, and ethically sound in the digital age.

Key motivations for this study include the need to adapt skills to AI processes, achieve efficiency gains, stay ahead of emerging risks like AI-driven fraud, foster continuous improvement and innovation, and address education and training needs for future Forensic Accountants.

The significance of this study lies in its potential to drive adoption, efficiency, risk management, innovation, education, competitiveness, and policy development within the realm of Forensic Accounting practices in Canada. By contributing to knowledge advancement, professional development, and industry competitiveness, this research aims to provide valuable insights and recommendations for maximizing the benefits of AI technologies in financial investigations.

In conclusion, the research on AI's impact on Forensic Accounting practices is essential for shaping the future of financial investigations, ensuring responsible AI deployment, and enhancing the effectiveness and integrity of Forensic Accounting practices in Canada.

1.0   INTRODUCTION

1.1   <u>Background and Context</u>

Identification and prevention of financial fraud, mismanagement, and other abnormalities within firms are critical tasks for Forensic Accounting. It involves the use of accounting, auditing, and investigative procedures to unearth evidence, evaluate financial data, and support legal proceedings[1]. The importance of Forensic Accounting has grown in Canada and many other nations because of the necessity for accountability and transparency in company operations, the rising complexity of financial transactions, and the rise in white-collar crime[1]. To find abnormalities and irregularities in financial records, Forensic Accountants have historically relied on manual approaches and specialized instruments like data analysis software and financial modeling techniques[2]. However, Forensic Accounting procedures have undergone a substantial change because of the quick development of Artificial Intelligence (AI) technology. Artificial intelligence, which includes natural language processing, machine learning, and data mining techniques, has the potential to completely change the way Forensic Accountants examine and evaluate financial data[2].

Multiple variables are driving the usage of AI in Forensic Accounting. First off, AI systems are faster and more accurate than humans in processing large volumes of data[2].   This capacity is especially useful for identifying minute patterns and irregularities that point to financial misbehavior or fraud. Secondly, AI tools can automate repetitive tasks, allowing Forensic Accountants to focus their expertise on more complex analyses and strategic decision-making[3].   Moreover, the emergence of big data and digitalization has generated enormous volumes of structured and unstructured data, presenting both challenges and opportunities for Forensic Accounting professionals[3].

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[1]Mokhtar, R. (2019). Forensic accounting: Challenges and opportunities. Canadian Journal of Forensic Sciences, 4(2), 78-93.

[2]AICPA. (2020). Harnessing the power of data analytics. American Institute of Certified Public Accountants.

[3]Beryl Odonkor, et al (2024): The impact of Al on accounting practices. A. review Exploring how artificial intelligence is transforming traditional accounting methods and financial reporting in: World Journal of Advanced Research and review. Available at https://doi.org/10.30574/wjarr.2024.21.1.2721 Accessed May 01.2024

AI-powered analytics solutions may sift through this data deluge, discovering hidden insights and patterns that traditional methods may ignore. AI technologies can also improve fraud detection accuracy, strengthen risk assessment models, and allow proactive financial transaction monitoring[4].

The use of AI in Forensic Accounting raises issues and ethical questions, despite all these potential advantages. Data privacy, algorithmic bias, the interpretability of Al-produced insights, and the need for Forensic Accountants to undergo specific training are among the concerns that require attention[5].

Organizations and government agencies in Canada are beginning to see how AI can improve Forensic Accounting procedures, but different industries and organizations adopt and use AI technologies differently. While some of the top companies use AI-powered analytics to enhance their fraud detection and investigation procedures, others only use them for client services[6].

Thus, the purpose of this research paper is to investigate how artificial intelligence (AI) is affecting Forensic Accounting methods in Canada. It will do so by looking at adoption, use, advantages, difficulties, and implications for effectiveness and efficiency and looking at similar developed economies throughout the world for benchmarks. This study aims to further the developing subject of artificial intelligence in Forensic Accounting by examining real-world case studies, speaking with industry professionals, and obtaining empirical data.

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[4]ACFE. (2021). The evolution of forensic accounting in the digital age. Association of Certified Fraud Examiners.
[5]IFAC(2020).Artificial intelligence and ethics in accounting: A practical guide. International Federation of Accountants.
[6]PwC Canada. (2023). AI adoption trends in Canadian businesses. PricewaterhouseCoopers Canada.

1.2   Overview of Forensic Accounting and AI Integration: Global Context

The application of artificial intelligence (AI) technology to Forensic Accounting procedures is becoming increasingly popular on a global scale. Financial investigations are being revolutionized by AI's superior capabilities, including data analysis, machine learning algorithms, and pattern identification. Additionally, Forensic Accountants are using AI techniques to improve investigative results, detect fraud, uncover financial abnormalities, and streamline processes[2].

Many global variables, including the following, are driving the incorporation of Al in Forensic Accounting:

Globally, Forensic Accounting uses AI integration for several reasons:

- **Technological Advancements:** As artificial intelligence (AI) solutions for data analysis and anomaly detection continue to develop, Forensic Accountants' ability to manage complex financial data effectively is changing the field of Forensic Accounting[2].

- AI-driven automation enhances forensic investigations' efficiency and accuracy by managing tedious operations, examining big datasets, and precisely identifying possible fraud indications compared to conventional methods[2].

- Additionally, by offering real-time insights, early identification of suspicious activity, and predictive analytics to foresee possible fraud schemes, artificial intelligence (AI) assists Forensic Accountants in managing risks related to financial fraud and misconduct.

- Despite these advantages, integrating AI involves ethical questions about bias, openness, and data protection. Using Al in Forensic Accounting procedures also requires the ethical application of AI algorithms in decision-making.

- Regulatory frameworks around the world are adjusting to the incorporation of AI in Forensic Accounting by offering rules and guidelines to guarantee accountability, transparency, and compliance when using Al.

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[2]AICPA. (2020). Harnessing the power of data analytics. American Institute of Certified Public Accountants.

1.2.1 Overview of the Integration of AI and Forensic Accounting: Canadian Context

The use of AI in Forensic Accounting procedures is becoming more and more common in Canada. AI technologies are being embraced by Canadian businesses and organizations more frequently to boost productivity, reduce financial risk, and strengthen investigative capacities.

Canadian enterprises are utilizing AI tools including machine learning algorithms, data analytics, and AI-driven software solutions to detect irregularities in financial transactions, assess financial data, and streamline operations. Furthermore, professional development and training programs are becoming increasingly important in Canada to provide Forensic Accountants with the necessary skills and best practices for incorporating AI into their work. Also, as a means of addressing the difficulties associated with integrating AI into Forensic Accounting, Canada's legislative framework is changing, with a particular emphasis on data security and the moral application of AI.

Additionally, there is ongoing cooperation between government agencies in Canada and industry players to promote research, knowledge exchange, and innovation in AI applications. Consequently, compliance with industrial demands and legal standards is ensured. For instance, the Alberta Machine Intelligence Institute (Amii) is a research organization that frequently hosts stakeholder conferences and seminars.

While integrating AI into Forensic Accounting can lead to efficiency gains, risk management, and creativity, Canadian organizations also confront global problems in data security, talent recruiting, rapid technology advancements, and the requirement for Al's ethical use.

2.0   <u>**Overview of the Research Problem and Its Goals**</u>

A crucial part of financial inspection is Forensic Accounting, which is crucial for identifying and stopping financial misbehavior. But across the globe, including in Canada, the introduction of artificial intelligence (AI) technologies is bringing about revolutionary improvements in Forensic Accounting procedures. This study explores "The Impact of Artificial Intelligence on Forensic Accounting Practices in Canada," intending to provide a thorough analysis of the difficulties associated with integrating AI technology into Forensic Accounting procedures as well as their adoption and use.

2.1   <u>**Research Problem Statement**</u>

The incorporation of Al technologies into Forensic Accounting methods in Canada presents a complex research problem.

While artificial intelligence (AI) holds great potential for improving the depth, accuracy, and efficiency of financial investigations, its application also presents serious ethical and regulatory compliance issues as well as changes to the Forensic Accounting profession.   To ensure the responsible and successful integration of AI in Forensic Accounting processes, it is imperative to comprehend and tackle these issues.

2.2   <u>**Goals, Questions, and Objectives of the Research**</u>

To evaluate how artificial intelligence is currently being used in Forensic Accounting procedures by Canadian businesses and to compare the results to those of other developed economies that are comparable to Canada's.

Therefore, the following will be the goals:

- Evaluating the extent to which Canadian businesses have adopted artificial intelligence in their Forensic Accounting procedures in comparison to international benchmarks, as well as the variables influencing this adoption.

- Evaluating the impact of artificial intelligence on the efficacy and efficiency of Forensic Accounting investigations in Canada and comparing the results to those of other developed economies.

- Evaluating the ethical issues that come from the application of artificial intelligence to Forensic Accounting in Canada and how national and international regulatory frameworks manage these issues.

- Analyze how the use of artificial intelligence might affect the professional development of Forensic Accountants in Canada and what best practices from other countries might teach us.

3.0   **<u>Scope of Study</u>**

The study aims to investigate the adoption and use of Al technologies in Forensic Accounting in Canada, comparing it to other advanced economies. It will also look at the efficiency and effectiveness of the technology, identify any barriers to its widespread use, and offer recommendations based on global best practices.

3.1   **<u>What Motivated the Research</u>**

The following are some of the considerations that motivated this study:

- Requirement to Adapt Skills: To remain competitive as AI becomes more common in financial investigations, it is essential to comprehend its effects and modify one's skill set to fit the needs of Forensic Accountants.

- Efficiency and Cost Reduction: AI-driven routine task automation can result in quicker data processing and less human labor, which can save costs and increase efficiency significantly.

- Keeping Up with Emerging Hazards: Forensic Accountants face new difficulties as a result of AI-driven hazards that could lead to fraud. By researching AI's effects, Forensic Accountants can foresee and reduce these new hazards.

- Innovation and Continuous Improvement: Researching the effects of AI on Forensic Accounting procedures can promote innovation and continuous improvement because it might make it possible to find new instruments and methods that might improve procedures and produce better results in financial investigations.

- Future Forensic Accountants may require AI-related education and training as AI becomes more and more integrated into the field of Forensic Accounting.

4.0   **Review of Literature**

4.1.0   **Overview of the Relevant Literature**

Recently, the integration of artificial intelligence(AI) technology into Forensic Accounting procedures has garnered significant attention, transforming the landscape of global financial integration[7].

The possible effects of AI on Canadian Forensic Accounting procedures are becoming increasingly important to research as the technology develops. The purpose of this review of the literature is to investigate the current body of knowledge, theoretical frameworks, and empirical data about the acceptance, application, and consequences of artificial intelligence (AI) technologies in Forensic Accounting in Canada.

The introduction of artificial intelligence has brought about a paradigm shift in Forensic Accounting, which was previously dependent on manual methods and analysis[8]. Artificial intelligence (AI) technologies, including natural language processing, data analytics, and machine learning algorithms, present hitherto unseen possibilities to improve the efficacy, accuracy, and efficiency of financial investigations[8]. But these advantages come with drawbacks in terms of risk management, ethics, legislation, and training, therefore a careful analysis of AI's application to Forensic Accounting procedures is required.

Using fundamental ideas from Forensic Accounting, AI, and related fields, this literature study began by laying out the theoretical foundation for AI integration in Forensic Accounting. It explores the development of Forensic Accounting throughout history and the emergence of AI technology, offering background information for comprehending how they connect. The review then examined case studies, empirical research, and industry insights to evaluate the present level of AI adoption in Canada.

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[7]Smith, J. K. (2022). Enhancing efficiency in forensic accounting through artificial intelligence: A case study of Canadian firms. International Journal of Accounting Information Systems, 18(4), 203-218.

[8]Jones, R. A., & Brown, S. D. (2021), Artificial intelligence applications in forensic accounting: A comprehensive review. Journal of Forensic Accounting, 8(2), 45-62.

4.1.1 **Theoretical Framework:** Theories on risk management, ethics, regulation, Forensic Accounting, and artificial intelligence (AI) are all included in the theoretical framework that was examined.

4.1.2 **Theories of Artificial Intelligence (AI)**

- **Machine Learning (ML) Algorithms**: Using the power of digital, cloud, and artificial intelligence (AI), algorithms allow computers to learn from data, recognize patterns, and perform better when exposed to additional data. This is how AI technologies are revolutionizing business. This allows computers to learn without the need for special programming. Algorithms for machine learning comprise developing new algorithms or utilizing preexisting ones, feeding data into them, and using the data to train, test, and implement the models, as well as consume the models[9].

- **An Algorithm Known as "Reinforced Learning"** uses results to determine the best course of action to follow[9]. The algorithm gets feedback after every action to help it decide if the decision it made was right, wrong, or neutral[9.] This is a useful method for automated systems that have to make numerous minor judgments on their own without human assistance. It helps with text analysis and communication when employed in natural language processing (NLP), which enables AI systems to comprehend, interpret, and produce human language[9].

- **Neural Networks:** Modeling the structure and functions of the human brain, neural networks are a class of machine learning algorithms designed to detect patterns and draw conclusions[10]. Forensic Accounting uses neural networks to scrutinize financial data and search for anomalies.

- **Decision Tree Analysis:** Based on input features, decision trees are a type of supervised machine learning algorithm that can be used to categorize data. Because of their scalability, modular iterations, ease of interpretation and usage, and compatibility with other models, they are very helpful in Forensic Accounting[11].

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[9]Jurafsky, D., & Martin, J. H. (2019), Speech and Language Processing. Prentice Hall.
[10]Avinash Malladhi (2023):Transforming Information Extraction: AI and Machine Learning in Optical Character Recognition Systems and Applications Across Industries International Journal of Computer Trends and Technology Volume 71 Issue 4, 81-90, April 2023 ISSN: 2231 – 280. Available online: https://doi.org/10.14445/22312803/IJCTT-V71I4P110. Accessed April 30,2024
[11]Elena Boiarskaia, Navin Albert, and Denny Lee, (2019).Detecting Financial fraud at Scale with Decision Trees and MLflow on Databricks: Available on at: https://www.databricks.com/blog/2019/05/02/detecting-financial-fraud-at-scale-with-decision-trees-and-mlflow-on-databricks.html Accessed April 30,2024

- Forensic Accountants can examine unstructured data like contracts and legal papers, by using natural language processing (NLP) algorithms to find subtle patterns and motivations that might point to financial anomaly [12] .

By automating the analysis of large datasets and spotting intricate patterns that point to anomalies, Al and machine learning(ML)can greatly improve Forensic Accounting. The fast-paced financial sector requires accurate and efficient anomaly detection, which is something that automation can help with.

4.1.3 **Theories of Forensic Accounting**

- **Fraud Triangle Theory:** According to this theory, people commit fraud because of the convergence of the three components of the fraud triangle—opportunity, pressure, and rationalization.

By offering a framework for comprehending the psychological components of fraud, the fraud triangle directs the application of Al in fraud detection and prevention. By focusing on the particular components of opportunity, pressure, and rationalization, Al can successfully reduce the likelihood of fraud and safeguard companies from financial losses. Al's capacity for learning and adaptation makes it a tremendous tool in the continuous fight against fraud, ensuring that as deceptive techniques change, so too will how they may be identified and stopped[13].

Banks can use algorithms to monitor accounts over time and scrutinize transaction patterns for financial irregularities[13]. In e-commerce, Al evaluates risk by considering variables like transaction volume, frequency, and client purchasing history[13]. Online gamers use Al to monitor fraudulent transactions such as using stolen credit cards to purchase in-game currency[13].

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[12]Shashidhar Angadi (2023) 6 Ways Al can Revolutionize Digital Forensic: Available at: https://www.darkreading.com/application-security/6-ways-ai-can-revolutionize-digital-forensics. Accessed April 30, 2024

[13]Dan Zitting 2020: Using Machine Learning to Predict and Detect Fraud: Available at: https://www.forbes.com/sites/forbestechcouncil/2020/11/20/using-machine-learning-to-predict-and-detect-fraud/?sh=39e6a9488b4b. Accessed April 20, 2024

4.1.4 **Moral Theories**

The Rest four-component model and the ethical decision model framework are invaluable tools for Forensic Accountants [FA] to assess and address ethical dilemmas that arise with the use of Al in their investigations. By following these models, FA can ensure that their use of Al aligns with the ethical standards of their profession.

- **Ethical AI Design Principles:** Ethical AI design principles outlined by other experts inform the study's approach to developing and deploying AI technologies in Forensic Accounting. These principles emphasize fairness, transparency, accountability, and privacy in AI systems, ensuring responsible AI use and addressing ethical concerns.[14,16]
- **Ethical Decision-Making Models:** The research includes ethical decision-making models, such as the Ethical Decision-Making Framework[15] and the Rest's Four Component Model[16]. The Rest four model components provide a thorough framework for assisting people in making moral decisions. There are four main steps involved[15].

(i)   **Moral Sensitivity** is the capacity to analyze circumstances and comprehend the potential effects of various courses of action on diverse stakeholders[15,16].

(ii)   **Moral Judgment** is the ability to identify morally correct behavior based on an understanding of moral principles and codes of conduct.[15,16]

(iii)   **Moral Motivation** is the innate desire to prioritize moral behavior and create strategies to accomplish moral goals[15,16].

(iv)   **Moral Character** is the fortitude and moral rectitude to carry out moral objectives in the face of difficulty or resistance.[15,16]

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[14]Floridi, Luciano (2018), The Ethics of Artificial Intelligence. Oxford University Press

[15]Kimberly et al (2022): the Professional Values and Ethical Decision-making: Available at:https://www.nata.org/nata-now/articles/2022/04/pvs-and-ethical-decision-making#:~:text=Rest%E2%80%99s%20original%20model%20%281986%29%20and%20the%20Rest%20and%20Narvaez%20collaborative%20model%20%281994%29%20identified%20four%20processes%20that%20determine%20moral%20behavior%20by%20health%20professionals. Accessed April 20,2024

[16]Othmar Manfred Lehner, Kim Ittonen, Hanna Silvola, Eva Str€om, and Alena Wuhrleitner (2022) Artificial intelligence-based decision-making in accounting and auditing: ethical challenges and normative thinking. Available at:https://www.emerald.com/insight/content/doi/10.1108/AAAJ-09-2020-4934/full/pdf?title=artificial-intelligence-based-decision-making-in-accounting-and-auditing-ethical-challenges-and-normative-thinking Accessed May 19, 2024

Forensic accountants (FA) may find this model especially pertinent for the following reasons:

- By making sure that Al tools do not skew their results and that their conclusions are supported by evidence rather than hearsay, FA can preserve its impartiality and independence.

- To prevent sensitive data breaches, FA must guarantee the security of Al systems to safeguard customer confidentiality.

- FA needs to understand how these technologies fit into the legal system because they must abide by laws and regulations.

- When employing Al, FA must always upgrade their professional expertise. They need to keep up with technological knowledge and be aware of the ethical ramifications of new tools as they develop.

- When it comes to evaluating and resolving moral quandaries that emerge from the use of Al in research, FA may find that the Rest four-component model and the ethical decision model framework are useful resources. Forensic Accountants can make sure that their usage of Al complies with the moral requirements of their industry by adhering to these models.

AI Design Principles: The study's methodology for creating and using AI technologies in forensic accounting is informed by ethical AI design principles delineated by other specialists[14]. To ensure responsible AI use and address ethical concerns, these principles emphasize justice, transparency, accountability, and privacy in AI systems[14,16].

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[14]Floridi, Luciano (2018), The Ethics of Artificial Intelligence. Oxford University Press

[16]Othmar Manfred Lehner, Kim Ittonen, Hanna Silvola, Eva Str€om, and Alena Wuhrleitner (2022) Artificial intelligence-based decision-making in accounting and auditing: ethical challenges and normative thinking. Available at:https://www.emerald.com/insight/content/doi/10.1108/AAAJ-09-2020-4934/full/pdf?title=artificial-intelligence-based-decision-making-in-accounting-and-auditing-ethical-challenges-and-normative-thinking Accessed May 19, 2024

4.1.5 **Regulatory Theories**

Regulatory Compliance Models: The Forensic Accountant can benefit from models that provide guidelines for efficient internal management and regulatory compliance, such as the COSO framework (Committee of Sponsoring Organizations of the Treadway Commission)[18].

With a focus on governance and risk management, the COSO Enterprise Risk Management (COSO ERM) offers thorough risk management guidelines[16]. The following areas are where the COSO ERM framework provides guidance:

[i]. Executing and growing Al projects: It highlights the necessity for FA to comprehend Al-related risks to guarantee a return on investment and satisfy shareholders by honing and modifying Al initiatives, guaranteeing dependability and confidence in the Al platform[16].

[ii]. Risk management and governance. For any technology endeavor, including Al, governance is essential. After governance is created, FA needs to think about the risks related to Al, including how to manage them and the need for ongoing monitoring. For the Al projects, the COSO framework offers an organized method for creating and putting into practice governance, risk management, and oversight procedures. By following the guidelines provided by the COSO ERM framework, FA can control the risks related to Al, uphold the integrity of their investigations, and guarantee that their technology complies with moral and professional requirements[16,17]

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[16]Enterprise Risk Management/COSO Available at: https://www.coso.org/enterprise-risk-management Accessed May 15, 2024

[17]Ken Tysiac 2021): How to use COSO to implement and Scale Al projects 2021-09-15/ COSO ERM Framework and principles to help implement and scale Al projects. Available at: https://www.journalofaccountancy.com/news/2021/sep/coso-implement-scale-ai-projects.html#:~:text=COSO%20ERM%20Framework%20and%20principles%20to%20help%20implement%20and%20scale%20AI%20projects: Accessed May 15, 2024

[18]Arden Leland 2023: Fundamentals of COSO Framework Building Blocks for Integrated Internal Control: Available at: https://www.auditboard.com/blog/coso-framework-fundamentals/# Accessed May 15, 2024

Data Protection Regulations: Regulatory frameworks such as the Personal Information Protection and Electronic Documents Act (PIPEDA) in Canada and the General Data Protection Regulation(GDPR) in Europe address data privacy and security concerns. These frameworks are applicable when using AI[19,20].

While PIPEDA and GDPR both offer frameworks to address privacy and security concerns, GDPR often imposes more stringent criteria and a wider application. Businesses that use Al must carefully follow these rules to make sure they adhere to the requirements for accountability, openness, consent, and data protection[19,20].

The legal frameworks governing Al's use will also change as it develops, necessitating constant attention to detail and organizational adaptation to be compliant.

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[19]Government of Canada. (2020). Personal Information Protection and Electronic Documents Act (PIPEDA). Retrieved from https://www.priv.gc.ca/en/privacy-topics/privacy-laws-in-canada/the-personal-information-protection-and-electronic-documents-act-pipeda/ Accessed April 26, 2024

[20]EU. (2016), Regulation (EU) 2016/679 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data (GDPR). Official Journal of the European Union:http://data.europa.eu/eli/reg/2016/679/oj Accessed April 25, 2024

4.1.6 **Risk Management Theories**

Risk Assessment Matrix: When it comes to determining and ranking the inherent risks associated with the implementation and utilization of Al, a risk assessment matrix can be a useful tool. Consequently, it will be a useful matrix for determining, ranking, assessing, and controlling the risks related to Al integration in Forensic Accounting procedures[21].

To offer a formal approach to this process, the National Institute of Standards and Technology (NIST) has established the Al risk management framework (Al RMF)[21,22], which includes recommendations and best practices for the use of Al[21]. One can manage Al hazards by using the NIST 5-step technique[22]. The process entails defining the context, identifying risks, ranking risks, reducing risks, and putting complete strategies into action. This method is pertinent to Forensic Accountants since they need to guarantee the security and integrity of their Al-powered analysis.

Fraud Risk Matrix: The fraud risk assessment matrix helps organizations respond to risks appropriately by helping to quantify and prioritize risks[23]. It provides a clear picture of risks and their management strategies; often, a heat map illustrates the significance and likelihood of each identified fraud exposure [21]. The matrix can be used to identify dangers in Al financial investigations, including biased algorithms, data privacy issues, and the possibility of fraudsters manipulating or circumventing Al systems. It can also help make sure Al-driven fraud detection systems are not generating misleading negative results and assess how successful they are.

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[21]Shanika Wickramasinghe 2024:Risk matrix template: How to assess risk for project success available online at: https://asana.com/resources/risk-matrix-template.   Accessed April 15, 2024

[22]NIST AI Risk Management Framework (AI RMF 1.0) Launch | NIST Available online at: https://www.nist.gov/news-events/events/2023/01/nist-ai-risk-management-framework-ai-rmf-10
launch#:~:text=The%20NIST%20AI%20RMF%20is%20a%20framework%20to,and%20evaluation%20of%20AI%20products%2C%20services%2C%20and%20systems; Accessed May 19, 2024

[23]Fraud Risk Scoring: Available at: https://www.fraud.com/post/fraud-risk-scoring Accessed May 12, 2024

4.2.0 **Historical Review**

Understanding the historical development of Forensic Accounting procedures and Artificial Intelligence (AI) is crucial to comprehending how AI will affect Forensic Accounting in Canada and around the world. This analysis traces the major turning points and advancements in Forensic Accounting and Artificial Intelligence, emphasizing how these fields cross and how AI-driven techniques are becoming more common in financial investigations.

Early AI Developments: AI has a long history of development, characterized by important turning points that have influenced the field's direction. Al's journey, from the early speculations of mathematicians and philosophers to the complex algorithms and neural networks of today, is a monument to human creativity and the unwavering quest to comprehend and mimic intelligence. In the 17th century, researchers first proposed that machines could make decisions, laying the groundwork for the concept of machine intelligence[24]. Additional research investigated the mathematical potential for Artificial Intelligence and proposed that machines may use the knowledge at their disposal to solve issues and make decisions through intelligent behavior[24].

Rise of Machine Learning and Data Analytics: Driven by advances in computing and greater access to data, the 1980s and 1990s saw a notable breakthrough in machine learning (ML) algorithms and data analytics techniques[25]. Data-driven models replaced rule-based Al systems throughout this era, opening the door to more flexible and potent Al applications[24]. Pattern identification and predictive modeling benefited greatly from machine learning (ML) methods like neural networks and decision trees, with deep learning eventually changing the game[24].

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[24]Berland Marr 2021: The most Significant Ai Milestone: Available at:https://bernardmarr.com/the-most-significant-ai-milestones-so-far/#:~:text=The%20concept%20that%20one%20day%20machines%20would%20be%20capable%20of%20thinking%20and%20making%20decisions%20was%20first%20contemplated%20by%20mathematician%20Rene%20Descartes%20in%201637 Accessed May 10, 2024

[25]Mitchell, Tom M. (1997). Machine learning. McGraw Hill.

Uses of AI in Financial Services: Machine learning algorithms for risk assessment, fraud detection, and credit scoring were among the first uses of AI in the financial sector to gain popularity[26]. These early uses showed how Artificial Intelligence (AI) may enhance financial process efficiency and decision-making.

Evolution of Forensic Accounting: The field of Forensic Accounting originated in ancient societies when there were no sophisticated techniques for identifying financial abnormalities and fraud[26]. Nonetheless, the requirement for specialized knowledge in fraud investigation and the rise in financial crimes led to the development of Forensic Accounting as a modern discipline in the early 20th century[27].

AI and Forensic Accounting Intersection: In the late 2000s and early 2010s, Forensic Accounting procedures and AI technologies began to converge. Financial investigations incorporated sophisticated data analytics, machine learning, and natural language processing skills during this time [28].

Regulatory and Ethical Considerations: Stricter compliance requirements and ethical guidelines for financial reporting and auditing were introduced along with technological advancements by regulatory frameworks like the United States Sarbanes-Oxley Act (SOX)[29] and international standards like the International Financial Reporting Standards (IFRS) [30].

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[26]Dun & Bradstreet 2013:Applying advanced analytical method to help make confident and informed business decisions Available at: https://www.dnb.com/content/dam/english/dnb-solutions/risk-management/factsheet_predictive_analytics_%2062313.pdf.Accessed April 25, 2024

[27]Wells, J. T. (2005). Principles of fraud examination. John Wiley & Sons.

[28]Bologna, G., & Lindquist, B. (2020). Digital forensics and investigation methodologies. Available at: Digital forensics and investigations meet artificial intelligence | Annals of Mathematics and Artificial Intelligence (springer.com). Accessed May 01, 2024

29SEC. (2002). Sarbanes-Oxley Act of 2002. U.S. Securities and Exchange Commission Available at https://www.sec.gov/news/speech/spch020503psa.htm. Accessed April 24, 2024.

[30]IFRS Foundation. (n.d.). International Financial Reporting Standards (IFRS). Available at: https://www.ifrs.org/.Accessed April 25, 2024

Current Situation in Canada: Industry initiatives supporting AI innovation in financial services and regulatory frameworks like the Personal Information Protection and Electronic Documents Act (PIPEDA)[19] have encouraged the country's use of AI in Forensic Accounting techniques.

Technological Developments in Forensic Accounting: Over the years, technological breakthroughs have greatly impacted Forensic Accounting techniques. Computers changed data analysis and investigative techniques in the 1960s and 1970s, enabling Forensic Accountants to manage bigger amounts of financial data and do more complex analyses[31].

Rise of Artificial Intelligence (AI) in Financial Investigations: The late 20th and early 21st centuries saw the development of AI technologies, which had a profound impact on Forensic Accounting. Artificial intelligence (AI) techniques, including machine learning algorithms, data analytics software, and natural language processing skills, are now essential for recognizing potential fraud indications, finding abnormalities, and expediting investigation processes[28].

Adoption of AI in Canadian Forensic Accounting Practices: The demand for increased scalability, accuracy, and efficiency in financial investigations is driving the adoption of AI in Canadian Forensic Accounting practices[28]. Canadian firms and regulatory authorities are recognizing the potential of artificial intelligence(Al) technology to enhance risk management strategies and fraud detection skills [32].

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[19]Government of Canada. (2020). Personal Information Protection and Electronic Documents Act (PIPEDA).At: https://www.priv.gc.ca/en/privacy-topics/privacy-laws-in-canada/the-personal-information-protection-and-electronic-documents-act-pipeda/ Accessed April 26, 2024

[28]Bologna, G., & Lindquist, B. (2020). Digital forensics and investigation methodologies. Available at: Digital forensics and investigations meet artificial intelligence | Annals of Mathematics and Artificial Intelligence (springer.com). Accessed May 01, 2024

[31]Albrecht, W. S., et al. (2009), Fraud Examination. Cengage Learning. Available at: https://scholar.google.ca/scholar?q=Albrecht,+W.+S.,+et+al.+(2009),+Fraud+Examination.+Cengage+Learning.&hl=en&as_sdt=0&as_vis=1&oi=scholart. Accessed April 26, 2024

[32]Lim, T. Y., & Rahman, A. A. (2022), Adoption and utilization of artificial intelligence technologies in forensic accounting: Insights from Canadian firms. Journal of Financial Crime, 15(3), 150-165.

Challenges and Opportunities:

The incorporation of AI into Forensic Accounting procedures has presented issues such as data privacy, ethics, algorithmic biases, and regulatory compliance, even though it has brought about a few advantages. Forensic Accounting procedures will need to address these issues as well as make use of the benefits that Artificial Intelligence (AI) brings.

4.2.1   **Review of Empirical Literature**

The empirical literature review, which summarizes previously conducted studies and empirical data, examines the adoption, application, and consequences of artificial intelligence(Al) technology in Forensic Accounting methods.

Adoption and Usage of AI in Forensic Accounting: Research conducted in Canada by Lim and Rahman (2022)[32] examined the usage and adoption trends of AI technology in Forensic Accounting businesses. The research shows that the use of AI technologies is increasing, especially in activities related to data analysis, anomaly detection, and fraud risk assessment[32]. However, Canada's adoption rate is less than half that of the US[33].

Effect on Efficacy and Efficiency:

Based on CPA Canada studies, Al's impact on Canadian Forensic Accounting has resulted in more effective investigations. Additionally, by mining data for potential errors and alerting Forensic Accountants to potential difficulties, machine learning helps them focus their efforts[34].

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[32]Lim, T. Y., & Rahman, A. A. (2022), Adoption and utilization of artificial intelligence technologies in forensic accounting: Insights from Canadian firms. Journal of Financial Crime, 15(3), 150-165.

[33]KPMG 2023:U.S. outpacing Canada in business adoption of AI - KPMG Canada Accessed April 14, 2024

[34]CPA Canada(2023): Machine learning is leading the way in tracking financial tricksters - CPA Canada. Accessed April 14, 2024

Risk Management and Ethical Issues: Research by Grayson and Patel (2019)[35] looked at risk management techniques and ethical issues related to AI integration in Forensic Accounting procedures. They pointed out that algorithmic biases, data privacy, and the requirement for transparency in AI decision-making processes are the three primary ethical concerns[35]. Furthermore, frameworks for regulatory compliance, ongoing monitoring, and cybersecurity are all components of successful risk management strategies[35]. Bhargava N.S. & Co. (2023)[36] opined that when utilizing Al, Auditors should take into mind the following ethical concerns: data protection, data disposal, openness and accountability, human oversight, training and understanding, independence, and code of ethics[36].

Needs for Professional Development and Training: To effectively apply AI technologies and manage ethical challenges, Forensic Accountants need to have expertise in data analytics, cybersecurity, AI programming, and ethical AI use[37].

Trends in the Use of AI in a Few Selected Canadian Industries:

The use of Al has increased data analysis's effectiveness, speed, and efficiency across all industries. Research on the trends in AI adoption among Canadian Forensic Accounting firms has demonstrated a consistent rise in the incorporation of AI technology into diverse investigative procedures, such as fraud detection, pattern recognition, and data analysis[38].

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[35]Grayson, M., & Patel, S. (2019), Ethical challenges in the adoption of artificial intelligence technologies in forensic accounting: A Canadian perspective. Journal of Forensic Accounting, 12(1), 30-45.

[36]Bhargava N.S & Co (2023): Ethical Considerations in the Use of AI and Automation in Auditing (linkedin.com) Accessed April 14, 2024

[37]Abidoye, Adenike, et al (2024). Bridging the Gap: Integrating Forensic Accounting Skillsets for Enhanced Audit Quality in the Post-Pandemic Era. *Journal of Forensic Accounting Profession*, **3** (2), 63-81. Available online: Bridging the Gap: Integrating Forensic Accounting Skillsets for Enhanced Audit Quality in the Post-Pandemic Era - Sheffield Hallam University Research Archive (shu.ac.uk) Accessed April 15, 2024

[38]Smith, J., & Jones, A. (2020), Trends in artificial intelligence adoption among Canadian forensic accounting firms. Journal of Forensic Accounting Technology, 7(1), 40-55.

Additionally, clients' opinions of Al-based Forensic Accounting services were more favorable, with a focus on correctness, speed, and dependability in financial investigations[39].

Small and Medium Enterprises (SME) that used Al reported better decision-making processes, increased financial reporting accuracy, and the ability to identify possible fraud indicators[40].

Al-based analysis techniques in financial fraud cases improved document review accuracy and saved time during court proceedings[41].

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[40]Garcia, M., & Rodriguez, S. (2019), Customer perception of artificial intelligence-based forensic accounting services: A Canadian study. Journal of Forensic Accounting Services, 11(2), 75-90.

[41]Patel, R., & Kumar, V. (2018), AI-based financial statement analysis in Canadian SMEs: An empirical study. Journal of Small Business Finance, 5(2), 60-75.

[42]Anderson, M., & Brown, L. (2017), AI-based document analysis in Canadian legal proceedings: A case study. Journal of Legal Technology, 4(1), 25-40.

4.2.2   **Themes**

Artificial intelligence(Al) technologies have completely transformed the way Forensic Accountants carry out financial investigations, fraud detection, and risk management. With the potential to improve productivity, accuracy, real-time monitoring, and predictive analytics skills, Forensic Accountants in Canada are gradually turning to AI-driven products.

AI Technology Adoption Trends and Patterns in Forensic Accounting:

In the context of Canadian Forensic Accounting procedures, this subtopic looks at the adoption trends and patterns of AI technologies, including machine learning, natural language processing, and data analytics[38]. It entails examining the variables affecting the choice to adopt, the degree of AI integration, and the kinds of AI instruments that Forensic Accountants use most frequently[38].

When compared to international standards, an analysis of Canadian firms' current usage of Al in Forensic Accounting processes and the factors influencing its acceptance showed the followings:

❖ Although it is increasing, the use of Artificial Intelligence (AI) in Forensic Accounting procedures is still less than half that in the United States[43]. While 72% of US enterprises report employing Al in their operations[33], only 35% of Canadian businesses do the same[33]. Despite this, Canadian enterprise-scale firms have been deploying Al more frequently; as of November 2023, 37% of them were utilizing Al in their daily operations[43].

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[38]Smith, J., & Jones, A. (2020), Trends in artificial intelligence adoption among Canadian forensic accounting firms. Journal of Forensic Accounting Technology, 7(1), 40-55.

[33]KPMG 2023: U.S. outpacing Canada in business adoption of AI - KPMG Canada. Accessed April 14, 2024

[43]IBM Global Al Adoption Index 2023:Canadian businesses saw uptick in AI Adoption in 2023 vs. global peers (ibm.com) Accessed April 14, 2024

The following are some of the elements that influenced the use of Al in Canadian Forensic Accounting practices:

[i].   Lack of qualified expertise and high-quality data for training Al algorithms: This is a major obstacle to the efficient use of Al[33].   Canadian companies frequently encounter difficulties with data sets that are too little, too big, or incorrectly formatted, as well as a lack of internal competence to evaluate Al algorithms[33].

[ii]. Responsible Al frameworks: Compared to the US, where 72%[33] of organizations have implemented such frameworks, just 43% of Canadian firms have done so.   This suggests that more comprehensive governance frameworks that cover data integrity, privacy, dependability, and security are required[33].

[iii]. The adoption of Al technology is hindered by high costs, which makes it unlikely for Canadian companies to accelerate their Al investments.   The percentage of Canadian companies that plan to increase their spending by more than 20% in the upcoming year is just 8%, which is significantly lower than the global average[44].

[iv]. Technological infrastructure: Government rules, industry features, IT infrastructure, and backing from upper management all have an impact on the adoption of Al in the financial sector[45].

[v].   International competition: Canada is lagging other nations in terms of Al adoption and demand[44]. To compete internationally, Canadian enterprises must adopt Al more deeply and generate demand for technologies that are already opening possibilities for other nations.

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[33]KPMG 2023: U.S. outpacing Canada in business adoption of AI - KPMG Canada Accessed April 14, 2024

[44]Deloitte Canada: AI adoption among Canadian businesses stagnant: Only 16 percent of companies use AI, which remains unchanged since 2014 (deloitte.com). Accessed April 14, 2024

[45] How's ai influence accounting forensic; Available at
https://www.bing.com/search?pglt=43&q=SCiSpace+%3AHows+ai+influence+accounting+forensic+%7C+5+Answers+from+Research+papers+(typeset.io)+Accessed+April+14%2C2024&cvid=51d5dd2a7fb2413f8ef87b5611a75e8d&gs_lcrp=EgZjaHJvbWUyBggAEEUYODlBCDEyMzZqMGoxqAIAsAIA&FORM=ANSPA1&PC=ASTS Accessed April 14,2024

Almost all global leaders in financial services report implementing Al in some capacity, with an emphasis on enhancing the client and customer experience[46]. Over 80% of Forensic Accounting companies use Al in their investigations, and by 2028, the global market for Forensic Accounting solutions powered by Al is estimated to reach $10 billion[46].

Global best practices demonstrated that Al-powered systems are capable of real-time analysis of enormous amounts of data, spotting suspicious trends and abnormalities that point to fraudulent activity[47]. Furthermore, machine learning algorithms can improve detection capacities by continuously learning and adapting to new fraud techniques[47]. Also, state-of-the-art blockchain technology, sophisticated data analytics, and automated data processing are utilized to handle new challenges[47]. Generative Al and machine learning are becoming more popular in anti-fraud strategies[48].

In conclusion, albeit increasing, Canadian Forensic Accounting adoption of Al still trails behind worldwide benchmarks, especially in the US.

The necessity for qualified personnel, high-quality data, and responsible Al frameworks, investment in technology all have an impact on adoption. To maintain competitiveness worldwide Canadian businesses can improve their Al capabilities by focusing on real-time market research and international best practices. These practices include cloud computing, generative Al, adapting machine learning, and data analysis.

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[46]EY Survey: Al adoption among financial services leaders universal, amid mixed signals of readiness; EY Survey AI adoption among financial services | EY - US Accessed April 14, 2024

[47]Ken Feinstein, etal., 2023:Detecting Fraud Using Emerging Technology: Don't be afraid to Innovate: Detecting Fraud Using Emerging Technology: Don't Be Afraid to Innovate - Ocean Tomo Accessed April 14, 2024

[48]The 2024 Anti-Fraud Technology Benchmarking Report Insight Available at: https://www.acfe.com/acfe-insights-blog Accessed April 14, 2024

- **Gains in Efficiency and Effectiveness from AI Integration**: This theme examines the concrete advantages of integrating AI in Forensic Accounting procedures in terms of effectiveness and efficiency. One can argue that Artificial Intelligence has emerged as a key tool in improving the effectiveness and efficiency of Forensic Accounting investigations after examining how AI affected these outcomes in Canada and how they compared to findings from other developed economies. In Canada, forensic accountants are increasingly using machine learning, a subset of AI, to identify areas that require deeper research [34]. In addition to lowering the possibility of fraud losses, this technology is facilitating more in-depth investigations[34]. Machine learning makes it possible to forecast future events, which is critical for fraud detection[34]. Data is analyzed to identify trends and patterns. Additionally, it helps gather data from publicly accessible sources, such as news stories, which is useful for spotting possible problems[34]. AI finds its application in Forensic Accounting on a global scale. Forensic Accounting Research (FAR) is more advanced in the USA and Canada than it is in Europe, Oceania, and Asia[49], therefore the level of its implementation differs by location.

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[34]CPA Canada(2023): Machine learning is leading the way in tracking financial tricksters - CPA Canada. Accessed April 14, 2024

[49]Financial reporting and accounting: Journal of Financial Reporting and Accounting | Emerald Publishing Available at https://www.emeraldgrouppublishing.com/journal/jfra. Accessed April 13, 2024

Studies conducted in Canada have become more effective because of Al's influence on Forensic Accounting. By mining data for suspected faults, machine learning helps Forensic Accountants concentrate their efforts and warns them of potential issues[34]. In addition to being preventative, fraud risk assessments are a potent tool for safeguarding businesses against fraud[34]

In contrast, the global impact of Al on Forensic Accounting highlights the necessity of trustworthy Al applications. Amendments to the Federal Rules of Evidence are being called for to consider Al's reliability, highlighting its increasing significance in Forensic Accounting research and testimony[50].

Opportunities and Challenges: Canada has unique obstacles that affect Al's uptake and efficiency in Forensic Accounting. It appears that Canada and other affluent nations of a similar caliber are dealing with comparable obstacles when it comes to the use of Al in Forensic Accounting. Data privacy, objectivity and bias, transparency, reliability, and accountability are some of these difficulties[51]. The COVID-19 pandemic has brought even more attention to the necessity of Al in risk and performance management for businesses since Al helps to minimize disruptions and improve the effectiveness of accounting information systems[52].

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[34]CPA Canada(2023): Machine learning is leading the way in tracking financial tricksters - CPA Canada. Accessed April 14, 2024

[50]Victor N. Metallo, (2020): The Impact of Artificial Intelligence on Forensic Accounting and Testimony--Congress Should Amend "The Daubert Rule" to Include a New Standard (emory.edu)

[51]Fadi S Shiyyab, Abdallah B. Alzoubi et al (2023): IJFS | Free Full-Text | The Impact of Artificial Intelligence Disclosure on Financial Performance (mdpi.com); Accessed April 13, 2024

[52]Al Mustafa, Hamza et al (2023:The impact of COVID-19 on firm risk and performance in MENA countries: Does national governance quality matter? - PubMed (nih.gov) Accessed April 14, 2024

Professional Development and Academic Interest: Enrollment in related programs, including the University of Toronto MFAcc program, is leading the way in Canada's noticeable rise in academic interest in Forensic Accounting. This reflects the increasing intricacy of financial plans and the need for reliable advisors in the industry. This pattern is in line with the growing demand for new standards and or an amendment to the Daubert rule of evidence[50] and the worldwide emphasis on the value of Forensic Accounting specialists in the era of Al.

In conclusion, artificial intelligence is significantly enhancing the success and efficiency of Forensic Accounting investigations in Canada, a trend that is also evident globally. Comparing Canada's adoption rate to other economies with comparable economies around the world, it is still low. Legal frameworks, the intricacy of financial crimes, and technical improvements all have an impact on the adoption of Al in Forensic Accounting techniques. Al's importance in Forensic Accounting is predicted to increase as Canada draws closer to establishing a beneficial ownership registry. Al's significance in this subject is further shown by the rise in professional development opportunities and scholarly curiosity.

The ethical challenges and considerations of AI-driven Forensic Accounting in Canada, as well as how national and international regulatory frameworks approach these issues:

This subtopic explores the moral conundrums and issues raised by the application of AI to Forensic Accounting. It examines matters including algorithmic biases, data privacy, accountability, justice, transparency, and the moral ramifications of AI-driven decision-making in financial investigations[14].

The use of artificial intelligence(AI) in Forensic Accounting raises several ethical issues to preserve the integrity of the field.

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[14]Floridi, Luciano (2018), The Ethics of Artificial Intelligence. Oxford University Press.

[50]Victor N. Metallo, (2020): The Impact of Artificial Intelligence on Forensic Accounting and Testimony--Congress Should Amend "The Daubert Rule" to Include a New Standard (emory.edu). Accessed April 25, 2024

The following were mentioned by Bhargava N.S. & CO (2023)[36] as ethical factors that auditors should consider:

[i]   Data privacy: adhering to laws such as the Health Insurance Portability and Accountability Act (HIPAA)[53] in the US and the General Data Protection Regulation (GDPR) in Europe is essential for protecting sensitive financial and personal data. Both laws are comparable to Canada's Personal Information and Electronic Document Act (PIPEDA).

[ii]   Data disposal: To stop sensitive information from being misused, data must be disposed of ethically.

[iii]   Accountability and openness: Al has the power to make audits less transparent, which raises questions regarding the auditing process's accountability and openness.

[iv]   Human oversight: To guarantee transparent and defendable decision-making, there should be procedures in place for human auditors to examine and contest Al-generated findings.

[v]   Training and comprehension: For auditors to comprehend and analyze the output produced by Al and automation tools, they need to receive the appropriate training.

[vi]   Independence: If the auditors have financial stakes in Al technology or have conflicts of interest with the audited firms, ethical concerns could surface.

[vii]   Code of Ethics: To maintain their independence from Al providers and audited businesses, auditors and their firms are required to abide by a stringent code of ethics.

[viii] Error management: It's crucial to have precise policies in place for handling mistakes, including who is responsible for what and how to fix it.

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[36]Bhargava N.S & Co (2023): Ethical Considerations in the Use of AI and Automation in Auditing (linkedin.com) Accessed April 14, 2024

[53]Xiang D, Cai W. Privacy Protection and Secondary Use of Health Data: Strategies and Methods. Biomed Res Int. 2021 Oct 7;2021:6967166. Doi: 10.1155/2021/6967166. PMID: 34660798; PMCID: PMC8516535. Available online at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8516535 Accessed May 15, 2024

[ix]   Transparency in regulations: regulatory organizations ought to have standards for openness in the Al systems that are utilized for audits.

[x]   Liability Insurance: Businesses need to be sufficiently covered by insurance to handle liabilities arising from automation faults and Al.

[xi]   Collaborative Ethical Standards: To create and implement ethical standards for the use of Al, organizations, auditors, and regulatory agencies must work together.

The Canadian government is committed to the ethical use of Al, adhering to regulations and prioritizing values, ethics, and laws [54]. The common approach to Al governance among digital nations emphasizes principles like transparency, giving individual and community needs top priority, and minimizing risks to legal rights and democratic norms.

Canada is one of the founding members of the Global Partnership in Artificial Intelligence (GPAI)[55.] GPAI tries to bring experts together to formulate policies that will ensure the ethical use of Al. Also in 2022, Bill C-27 which has passed the second reading in the parliament was sponsored[56]. This bill provides a framework for the safe adoption and ethical use of Al. When this bill becomes law, we anticipate it will encourage the safe use of Al.

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[54]Exploring the future of responsible Al in government. Available at: https://www.canada.ca/en/government/system/digital-government/digital-government-innovations/responsible-use-ai.html Accessed April 14, 2024

[55]The Global Partnership in Artificial Intelligence Available at: https://gpai.ai/# Accessed May 24, 2024

[56]Artificial Intelligence and Data Act(AIDA): https://ised-isde.Canada,ca/site/innovation-better-Canada/en/artificial-intelligence-and-data-act-aida-companion-document. Artificial Intelligence and Data Act (canada.ca) Accessed May 24, 2024

Also, the Federal Court of Canada released two new documents on December 20, 2023, which offer important guidelines for the use of AI in court proceedings[57]. First, a notice on the use of generative AI by parties, attorneys, and interveners in court proceedings will have to be sent to the parties and the legal community[57]. When utilizing generative AI, the notice suggests that parties consider two guiding principles. It placed a strong emphasis on warnings and made sure that the Court's members understood how important it was to confirm the outcomes of any AI-generated outputs they could be tempted to utilize in their work[57]. Additionally, the Court stresses the need to use only reputable and well-known sources when referring to policies and commentaries[57] and advises caution when using AI-generated legal references or analysis.

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[57]Interim Principles and Guidelines on the Court's use of Artificial Intelligence(Dec 20, 2023) Available at: https://www.fct-cf.gc.ca/en/pages/law-and-practice/artificial-intelligence. Accessed May 02, 2024

When rendering decisions and orders, including deciding which topics to consider, the court will not decide using algorithms or automated decision-making methods without first consulting the public[57].

Before implementing any specific use of AI that could affect the public or the profession, the Court will consult with pertinent stakeholders[57].

Thirdly, when employing any internal use of AI, the Court will uphold the values of responsibility, respect for human rights, non-discrimination, accuracy, transparency, cybersecurity, and keeping people informed[57].

Around the world, in addition to the existing regulatory framework like the General Data Protection Regulation (GDPR) which sets high standards for data protection in the European Union (EU), various regulatory and ethical frameworks are being enacted such as the EU AI Act that was announced on Aug 6, 2023, meant to provide legal framework for ethical use of AI within EU by ensuring that AI systems are safe, transparent, traceable, non-discriminatory and environmentally friendly[58]. The Act will have substantial repercussions for businesses and organizations operating within the EU, as well as those outside the EU that create or install AI systems for the EU market with the potential of having worldwide implications[58]. The Canadian government is committed to the ethical use of AI, adhering to regulations and prioritizing values, ethics, and laws.

In October 2023, the US passed an executive order about artificial intelligence[59]. Its goal is to create a governance framework for AI technologies and represents a thorough strategy for maximizing AI's advantages while reducing any possible risks. This executive decree created new requirements for AI Safety, Security, Trustworthiness, and Equity[59].

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[57]Interim Principles and Guidelines on the Court's use of Artificial Intelligence(Dec 20, 2023) Available at: https://www.fct-cf.gc.ca/en/pages/law-and-practice/artificial-intelligence. Accessed May 02, 2024

[58]EU AI Act (2023): First regulation on artificial intelligence. At: https://www.europarl.europa.eu/topics/en/article/20230601S Accessed May 02, 2024.

[59]Fact Sheet: President Biden Issues Executive Order on Safe, Secure, and Trustworthy Artificial Intelligence. Available at: https://www.whitehouse.gov/briefing-room/statements-releases/2023/10/30/fact-sheet-president-biden-issues-executive-order-on-safe-secure-and-trustworthy-artificial-intelligence/#:~:text=Develop%20standards%2C%20tools%2C%20and%20tests%20to%20help%20ensure%20that%20AI%20systems%20are%20safe%2C%20secure%2C%20and%20trustworthy Accessed May 02, 2024

OECD Al Principle Overview: The OECD framework for the regulation of Artificial Intelligence provides a comprehensive set of principles and tools designed to promote the development of AI that is innovative, trustworthy, and respectful of human rights[60]. It provides a common understanding of Al systems; the framework can assist policymakers and organizations in managing Al risks and ensuring Al technologies contribute positively to society and the economy[60]. Despite not being legally binding, the widely adopted principles serve as a benchmark for global Al policy regulation among the G20 nations committed to developing similar frameworks[60]

The UNESCO Recommendation on Ethical Use of Al: UNESCO sets a global standard for the ethical development and use of Al technologies by providing a comprehensive framework for member states to create legal structures that promote the positive aspects of Al while safeguarding against its potential harms. The Collaboration between UNESCO, Member states, and private entities is crucial in advancing these ethical guidelines and ensuring that Al serves humanity's common good[61]

In summary, the ethical use of Al in Forensic Accounting is of concern in Canada as well as other countries of the world. Just like other developed economies of the world, Canadian regulatory frameworks are evolving to address these concerns, with a focus on transparency, accountability, and ethical standards. As Al continues to transform Forensic Accounting, ongoing collaboration between stakeholders and adherence to ethical guidelines will be essential to maintain trust and integrity in the profession.

Risk Management Strategies for AI-Driven Forensic Investigations:

This subtopic focuses on developing and implementing effective risk management strategies to address risks associated with AI adoption in Forensic Accounting. It includes cybersecurity threats, algorithmic biases, data integrity issues, regulatory non-compliance risks, and ways to mitigate these risks in AI-driven forensic investigations (John C. Hull (2019)[62].

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[60]Al Principles Overview. Available at: https://oecd.ai/en/ai-principles. AI Principles Overview - OECD.AI. Accessed May 24, 2024

[61]The UNESCO Recommendation on Ethical use of Al: https://www.dataguidance.com/opinion/international-unesco-recommendation-ethics#:~:text=The%20Recommendation%20proposes%20a%20global,%2C%20society%2C%20and%20the%20environment. Accessed May 24, 2024

[62]John C. Hull (2019): Risk Management and Financial Institutions. Available at: https://www.wiley.com/en-ca/Risk+Management+and+Financial+Institutions, +6th+Edition-p-9781119932482. Accessed May 02, 2024

Professional Development and Training Needs for AI in Forensic Accounting:

This theme explores the skills, knowledge, and training required for Forensic Accountants to effectively utilize AI technologies.   It includes AI programming, data analytics, cybersecurity, ethical AI use, and the incorporation of AI-related training in professional development programs for Forensic Accountants. Automation is coming big time and there is a need for FA to grow with Al to maintain competitive advantage (Abidoye, Adenike 2024)[37.]

[37]Abidoye, Adenike, et al (2024). Bridging the Gap: Integrating Forensic Accounting Skillsets for Enhanced Audit Quality in the Post-Pandemic Era. Journal of Forensic Accounting Profession, 3 (2), 63-81. Available online: Bridging the Gap: Integrating Forensic Accounting Skillsets for Enhanced Audit Quality in the Post-Pandemic Era - Sheffield Hallam University Research Archive (shu.ac.uk). Accessed April 15, 2024.

4.2.3 <u>**Comparative Analysis of AI-driven and Traditional Forensic Accounting Methods**</u>

While traditional methods used in Forensic Accounting have relied on manual analysis of financial documents, interviews, and audits, Forensic Accounting uses specialized techniques to investigate financial irregularities and fraud. However, the integration of Artificial Intelligence (AI) technologies has revolutionized Forensic Accounting practices, offering advanced analytical capabilities, automation, and predictive modeling[63].

AI technologies, such as machine learning algorithms and data analytics tools, can process large volumes of financial data at high speed, leading to improved efficiency and accuracy in detecting anomalies and potential fraud indicators[63]. Traditional Forensic Accounting methods often rely on manual data analysis and sampling techniques, which can be time-consuming and less effective in handling large datasets, leading to potential oversight of fraudulent activities.

Furthermore, unlike traditional methods that may require periodic audits to identify fraud in real time, AI technologies enable real-time monitoring of financial transactions and activities, allowing for proactive fraud detection and immediate alerts to suspicious activities, thereby reducing the risk of financial losses[64].

Additionally, AI solutions are scalable and adaptable to evolving fraud schemes and financial complexities, making them suitable for handling large datasets and diverse types of financial transactions[65]. Traditional methods may face scalability issues and require significant manual effort and resources to handle increasing data volumes and complex analyses.

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[63]Johnson, A. (2022). "Enhancing Efficiency in Forensic Accounting through AI: A Comparative Analysis." International Journal of AI Research, 10(1), 78-92.

[64]Garcia, M., & Patel, S. (2019), "Real-Time Monitoring in AI-Driven Forensic Accounting." Journal of Forensic Accounting Practice, 12(3), 120-135.

[65]Anderson, M., & Lee, K. (2018), "Scalability of AI Solutions in Forensic Accounting." Journal of Accounting Technology, 11(1), 50-65.

Comparatively, the initial investment in AI technologies may be significant, but in the long run, there will be cost savings through improved efficiency, reduced manual effort, and enhanced fraud prevention capabilities. The traditional methods may incur higher costs in terms of manpower, time, and resources required for manual data analysis and investigation processes.

Finally, AI complements human expertise by automating repetitive tasks and data analysis, allowing Forensic Accountants to focus on complex analysis, strategic decision-making, and interpreting AI-generated insights. Traditional methods rely on human expertise and judgment, with limitations in handling large datasets and complex data patterns.

4.2.4 Integration of AI Technologies in Forensic Accounting:

The synthesis of AI technologies in Forensic Accounting involves integrating various AI tools such as machine learning algorithms, natural language processing (NLP) techniques, data analytics platforms, and cognitive computing systems[66]. Often Forensic Accounting investigations combine these technologies to enhance data analysis, fraud detection, pattern recognition, and decision-making processes.

Integration of AI technologies allows Forensic Accountants to leverage advanced algorithms and automated processes for analyzing large volumes of financial data, identifying anomalies, detecting fraud patterns, and generating actionable insights more efficiently and effectively.

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[66]Chen, Q., & Kumar, A. (2020), "Human-AI Collaboration in Forensic Accounting." Journal of Forensic Accounting Technology, 9(2), 65-80.

Also, integrating AI-driven forensic tools with existing practices involves aligning AI solutions with traditional investigative methodologies, frameworks, and regulatory compliance requirements. Forensic Accountants need to seamlessly incorporate AI technologies into their workflow, ensuring compatibility, data security, and adherence to ethical standards[67]. This seems to be the optimal method of utilizing AI as a tool, considering both its advantages(like its rapid analysis of large data sets) and its drawbacks. Forensic Accountants should feel more comfortable using AI as a tool and not as a substitute for traditional investigative methods.

Effective integration may require training, and collaboration between AI Specialists and Forensic Accountants, or in some cases, there may be a need for customization of AI tools to specific investigative needs, and continuous monitoring and evaluation of AI-driven processes to ensure accuracy and reliability.

Again, the synthesis of AI-generated insights with human expertise emphasizes the importance of human-AI collaboration in Forensic Accounting. While AI technologies excel in data analysis, pattern recognition, and automation, human Forensic Accountants provide critical domain knowledge, interpretive skills, and ethical judgment necessary for contextualizing AI-generated findings[68].

Integrating AI insights with human expertise ensures a comprehensive approach to financial investigations, where AI tools augment human capabilities, assist in decision-making, and enhance the overall effectiveness of Forensic Accounting practices.

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[67]Garcia, M., & Lee, K. (2021), "Integrating AI-Driven Tools in Forensic Accounting Practices." Journal of Forensic Accounting Practice, 14(2), 80-95.

[68]Chen, Q., & Patel, S. (2020), "Synthesizing AI Insights with Human Expertise in Forensic Accounting." Journal of Accounting Technology, 12(1), 40-55.

Furthermore, integrating AI ethics and compliance frameworks will involve embedding ethical principles, regulatory guidelines, and transparency measures into AI-driven Forensic Accounting processes. Forensic Accountants must ensure that AI technologies adhere to ethical standards, respect privacy rights, avoid biases, and comply with legal requirements[69]. The integration of AI ethics and compliance frameworks will promote trust, accountability, and responsible AI use in Forensic Accounting, fostering public confidence and mitigating potential risks associated with AI adoption.

4.2.5 **The Gaps and Limitations**

The gaps and limitations highlight the complexities and challenges associated with the adoption and integration of AI technologies in Forensic Accounting practices, emphasizing the need for addressing data quality issues, algorithmic biases, cost considerations, ethical concerns, skill development, and regulatory compliance to maximize the potential of AI while mitigating risks.

[i].   One of the key limitations in AI-driven Forensic Accounting is the dependence on data quality and reliability. AI algorithms heavily rely on accurate and comprehensive datasets for training and analysis. However, if the data used is incomplete, outdated, or biased, it can lead to inaccurate results and erroneous conclusions[70]

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[69]Floridi, Luciano, Josh Cowls, Thomas C king, Mariarosaria Taddeo (2020), "Integrating AI Ethics in Forensic Accounting: Challenges and Opportunities." Journal of Ethics in Technology, 8(2), 90-105.

[70]Chen, Q., & Smith, J. (2021), "Data Quality Challenges in AI-Driven Forensic Accounting." Journal of Forensic Accounting Technology, 10(2), 75-90.

[ii].   Furthermore, AI algorithms may exhibit biases due to the nature of the data used for training, which can result in skewed results or discriminatory outcomes. The lack of interpretability in some AI models poses challenges in explaining the rationale behind AI-generated insights, making it difficult for Forensic Accountants to validate and trust the results[71].

[iii].   Implementing AI technologies in Forensic Accounting practices requires significant initial investments in technology infrastructure, software development, training programs, and ongoing maintenance. Smaller firms or organizations with limited resources may face challenges in adopting AI solutions, thereby creating a disparity in access to advanced forensic tools[72].

[iv].   The use of AI in Forensic Accounting raises ethical and privacy concerns related to data confidentiality, informed consent, algorithm transparency, and potential misuse of AI-generated insights[73]. One way for Forensic Accountants to navigate these ethical dilemmas is to ensure compliance with legal and regulatory frameworks governing data protection and privacy.

[v].   While AI technologies offer advanced capabilities in data analysis and automation, there is a need for skilled professionals who can effectively leverage AI tools, interpret AI-generated insights, and make informed decisions[37]. Bridging the skill gap and promoting effective human-AI collaboration is crucial for maximizing the benefits of AI in Forensic Accounting practices[37].

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[71]Garcia, M., & Patel, S. (2022), "Algorithmic Bias and Interpretability Challenges in AI-Driven Forensic Accounting." Journal of Accounting Technology, 13(1), 40-55.

[72]Anderson, M., & Lee, K. (2021), "Cost and Resource Intensiveness of AI Adoption in Forensic Accounting." Journal of Forensic Accounting Practice, 15(1), 60-75.

[73]Floridi, Luciano, Taddeo M, Roberts H, Morley, J, Josh Cowls, Nikita Aggarwal, Andreas Tsamados (2021), "Ethical and Privacy Challenges in AI-Driven Forensic Accounting." Journal of Ethics in Technology, 9(2), 80-95.

[37]Abidoye, Adenike, et al (2024). Bridging the Gap: Integrating Forensic Accounting Skillsets for Enhanced Audit Quality in the Post-Pandemic Era. *Journal of Forensic Accounting Profession*, 3 (2), 63-81. Available online: Bridging the Gap: Integrating Forensic Accounting Skillsets for Enhanced Audit Quality in the Post-Pandemic Era - Sheffield Hallam University Research Archive (shu.ac.uk). Accessed April 15, 2024

[vi].   Again, the evolving nature of AI technologies poses challenges in ensuring regulatory compliance and aligning AI practices with legal frameworks. Forensic Accountants must navigate complex regulatory requirements, data governance policies, and industry-specific regulations to ensure responsible and ethical use of AI tools in financial investigations[74].

4.2.6 **Theoretical Contribution**

The theoretical contributions advance the understanding, implementation, and ethical use of AI technologies in Forensic Accounting, thereby contributing to the development of frameworks, models, guidelines, and training programs that enhance the efficiency, accuracy, transparency, and ethical standards of AI-driven forensic investigations. For example:

[i].   Theoretical contributions involve developing frameworks and models for the effective integration of AI technologies into Forensic Accounting practices. These frameworks provide structured guidelines and methodologies for implementing AI-driven tools, addressing data quality issues, ensuring algorithmic transparency, and optimizing AI adoption for fraud detection and financial investigations[75.]

[ii].   In addition, the theoretical contributions in ethics and AI focus on developing ethical frameworks and guidelines for the responsible use of AI technologies in Forensic Accounting. These frameworks address ethical considerations such as algorithmic bias, data privacy, transparency, accountability, and fairness, thereby promoting ethical AI practices and mitigating potential risks[76].

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[74]Artificial Intelligence supporting cross-border cooperation in criminal justice: available online: https://www.eurojust.europa.eu/sites/default/files/assets/artificial-intelligence-cross-border-cooperation-criminal-justice-report.pdf Accessed April 30, 2024

[75]Chen, Q., & Patel, S. (2023), "Advancing AI Integration Frameworks in Forensic Accounting." Journal of Forensic Accounting Technology, 12(2), 90-105.

[76]Floridi, L., Riccardo Ghoni, Mariarosaria Taddeo (2023), "Ethical Frameworks for AI Use in Forensic Accounting." Journal of Ethics in Technology, 11(1), 55-70.

[iii]. By studying how Forensic Accountants (FA) interact with Al-driven tools, integrating human judgment with Al-generated insights, and developing collaborative decision-making frameworks that leverage the strengths of both human expertise and Al capabilities, the theoretical contributions explore human-AI interaction and collaboration models specific to Forensic Accounting[77].

[iv]. The theoretical contributions address regulatory compliance and governance frameworks related to AI adoption in Forensic Accounting. This includes studying regulatory requirements, data governance policies, legal frameworks, and industry standards governing AI use, and proposing governance models that ensure compliance, accountability, and transparency in AI-driven forensic investigations[78].

[v]. Also, in the era of Artificial Intelligence (Al), the theoretical contributions focus on skill development and training programs for Forensic Accountants. This includes designing curriculum frameworks, certification programs, and continuous professional developments that equip Forensic Accountants with the necessary AI skills, knowledge, and ethical guidelines to effectively leverage AI technologies in their practice[37].

[77]Garcia, M., & Lee, K. (2022), "Human-AI Interaction Models in Forensic Accounting." Journal of Accounting Technology, 14(2), 80-95.

[78]EU. (2021), "Regulatory Compliance and Governance in AI Adoption for Forensic Accounting." Journal of Financial Compliance, 14(3), 130-145.

[37]Adenike, et al(2024). Bridging the Gap: Integrating Forensic Accounting Skillsets for Enhanced Audit Quality in the Post-Pandemic Era. Journal of Forensic Accounting Profession, 3 (2), 63-81. Available online: Bridging the Gap: Integrating Forensic Accounting Skillsets for Enhanced Audit Quality in the Post-Pandemic Era - Sheffield Hallam University Research Archive (shu.ac.uk) Accessed April 15, 2024.

4.2.7   **Conclusion of the Literature Review**

In summary, the literature review provided valuable insights into the evolving landscape of AI adoption, integration, challenges, and opportunities within the Forensic Accounting field. This review synthesized a wide range of scholarly works, empirical studies, theoretical frameworks, and industry reports to assess the current state of AI-driven Forensic Accounting and identify key themes, trends, gaps, theoretical contributions, and implications for practice.

The key findings of the literature review showed increased adoption of Al technologies, gains in efficiency and effectiveness, the need for an ethical and regulatory framework, training, and the need for human oversights in the adoption of Al.

Despite the advancements and benefits of AI in Forensic Accounting, Canada lags in the adoption and use of Al when compared to similar advanced economies. Some of the slow adoption rates may be due to the identified gaps and limitations previously explained.

5.0 　　**Research Methodology**

The study explores a combination of literature review, case study, and in-depth interviews of professionals in the field of Forensic Accounting and Artificial Intelligence. I employed the primary data collection method, and through in-depth interviews, I was able to identify my themes(the advantages of utilizing Al and the strategies to address its challenges), which I then analyzed to gather pertinent information about the subject.

The literature review and thematic analysis of the relevant case study provided secondary data. I analyzed a total of 10 cases, basing each analysis on the aforementioned themes.

First, I searched the University of Toronto library database for journals that I felt would have Forensic Accounting contents relevant to my research topic.

- ➢ Journal of Forensic Accounting Research: It returned 1,325 results; based on the title I selected 10 that I felt were of interest.

- ➢ The Journal of Forensic & Investigative Accounting returned 114 results, from which I scanned and selected 5 that I felt were relevant to my topic.

- ➢ Journal of Forensic Accounting returned 2,902 search results; based on the title, I selected 10 that I felt elicited my interest.

- ➢ Journal of Financial Crime returned 12,205 search results, based on which I selected 5 that I felt were of interest.

- ➢ Journal of Forensic Economics returned 5,506 search results, based on which I selected 3 that I felt were of interest.

I scanned the article introductions, discussions, and conclusions sections to assess whether the respective article had any relevant information regarding the research topic. Then I searched online using titles and abstracts within these previously identified journals and other journals and articles using keywords like Artificial intelligence; Al policies; Ethical principles; Digital Ethics; Ethics of Artificial Intelligence; Adoption of Al; Ethical challenges of

Al; Global trend of Al; Ethical use of Al; Al effectiveness and efficiency; cases on the adoption of Al; COSO ERM framework, regulation of Al, GDPR; OECD; UNESCO; Govt of Canada website (AIDA), PIPEDA, for recent guidelines on Al. Also, I searched online to find Institutions nearby that I might connect with locally. My search results returned Alberta Machine Intelligence Institute (Amii) which is an institution based in Edmonton Alberta and one of the three institutions in Canada dedicated to the advancement of Artificial Intelligence. The other two institutions were Mila located in Montreal and Vector Institute in Toronto.

I attended the Annual AI Conference "Upper Bound 2024" held on May 21-May 24,2024, to gain additional insight into the topic and network with industry experts. However, my attempt to conduct a formal interview(as required by the course) with some of Amii's staff and other industry experts was unsuccessful due to the project's timing and the Amii's staff's busy schedule for the annual conference, which prevented me from securing an audience. Some of my questions were answered during the conference's small session breakouts and networking breaks.

Also, I attended a webinar organized by CPA Edmonton on "The Forensic Accounting and Fraud Mitigation" on May 15, 2024, and was able to ask some questions from the speaker Mr. Graham Quast, CPA, CA.IFA, DIFA. CFE, CFF.

To complement the 10 case studies, I used the nonprobability sampling techniques and selected 3 respondents who were experts for my interview. The interview questions were developed to help me explore my motivation for the research. The interview questions were open-ended and helped explore in-depth the motivations for the research project. Thematic data analysis method was used, where the main themes and sub-themes were obtained from the literature review and complemented with the in-depth interviews conducted with industry experts.

Interviews conducted were with the following individuals who represent a mix of firms and a mix of seniority:

- **Simon Castonguay CPA, CA, CA•IFA, CISA, CFF,** is a Client Director in Canada with experiences in Risk Management, Forensic Accounting, Data Analysis, Finance, and Information Technology. (Telephone interview on April 24, 2024, between 1-1.30 Pm MT)

- **Daniel Tourangeau CPA, CA, MFACC, CFF, CFE** has over 20 years of experience working in Canada and Europe, 15 years of which has been in Forensic Accounting. He works for Ontario Security Regulators (Telephone interview on April 24, 2024, between 11-11.30 am MT)

- **Jack Martin, CPA, CISA, CPA•IFA, CFF** is a Partner and the National Leader of forensic, Data Analytics, and Advisory Services for KPMG LLP Canada (Telephone interview on May 03, 2024, between 8.30-9.45 am MT).

I submitted the interview consent forms to the MFACC program coordinator in accordance with the program directives on conducting the interviews.

The content of this report was derived from: literature reviews, including online review of periodic and scholastic publications, case study analysis, interviews, face-to-face question and answer sessions with industry practitioners at the "Upper Bound" Al conference 2024, and CPA Edmonton chapter, Forensic Accounting and Fraud Mitigation webinar.

5.1.0   **Examination of the Case Study**

A three-column table presents the summary of each case analysis, with column 1 highlighting the benefits of using AI, column 2 highlighting the likely challenges from its adoption, and column 3 outlining potential mitigation strategies to these challenges.

Case study #1: Deloitte's artificial intelligence-driven fraud risk assessment:

Background: Using ACL Analytics and Tableau**,** Deloitte employs ACL Analytics for data analysis and anomaly detection, and Tableau for advanced data visualization. Together, these tools yielded comprehensive insights into potential fraud risks and irregularities in financial data[79]. ACL's ability to handle large datasets and perform complex analyses quickly and accurately enabled Deloitte to flag high-risk lease agreements for further investigation. The findings were then visualized using Tableau, which presented the data clearly and interactively for stakeholders. An integrated Tableau dashboard monitored ACL's analysis of historical data, financial statements, and lease documents to identify risk factors and predict potential future issues.

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[79]Deloitte, "AI-driven Fraud Risk Assessment," available at https://www2.deloitte.com/us/en/pages/audit/solutions/ai-driven-fraud-risk-assessment.html accessed April 15, 2024

The Benefit of using Al	Likely challenges identified	Ways the challenges might have been mitigated.
Speed, accuracy, as large volume of data were analyzed within a relatively short time.	(i). Bias and discrimination (e.g. if the data used is biased it will be projected into the population.	(i). Continuously ensure fairness and inclusivity in Al-driven systems.
	(ii). Data privacy and Security (both personal & sensitive information assessed).	(ii). Need for robust data governance practices & secure infrastructure to protect individual privacy.
	(iii). Transparency and Accountability	(iii). Conducting rigorous testing & monitoring to identify and mitigate biases and errors.
		(iv). Emphasis must be placed on the need for transparency and accountability to derive trust in the systems. Although the complexity of Al algorithm may make this difficult, continuously engaging all stakeholders and explaining the rationale behind decisions will build trust.
		(v). It is important that human beings be involved in the development, application of Al to ensure ethical considerations are met.

Case #2: EY's Artificial Intelligence Enhanced Whistleblower Investigation

EY integrated advanced AI tools to enhance its whistleblower investigation processes. This initiative aims to improve the efficiency and effectiveness of handling whistleblower reports, which often involve analyzing large volumes of unstructured data to identify potential fraud and misconduct[80.] EY uses IBM Watson for natural language processing(NLP) and machine learning capabilities, as well as Reliability Trace for communication surveillance. EY used IBM Watson to analyze unstructured data from whistleblower reports, emails, and other communications[80.] Watson's NLP capabilities allowed it to process and understand large volumes of text data, identifying keywords, patterns, and sentiments that could indicate potential misconduct. This initial analysis helped prioritize the most relevant and high-risk cases for further investigation. EY implemented Relativity Trace to monitor and analyze communications within organizations[80]. Relativity Trace provided real-time surveillance and alerting capabilities, enabling EY to detect suspicious activities and patterns in emails, chat messages, and other digital communications. The integration with IBM Watson enhanced this process by applying advanced analytics and machine learning to identify potential red flags, such as unusual communication patterns or language indicative of fraudulent behavior. Watson's NLP capabilities identified key pieces of evidence that indicated possible collusion among several executives. Relativity Trace was then used to monitor ongoing communications and gather additional evidence[80].

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[80]Ernst & Young (EY), "AI-enhanced Whistleblower Investigation," https://www.ey.com/en_us/forensic-integrity-services/ai-enhanced-whistleblower-investigation. Accessed April 15, 2024

The Benefit of using Al	Likely challenges identified	Ways the challenges might have been mitigated.
Al was used in the documentation and initial review of complaints, ensuring they were handled efficiently and in accordance with organization-established protocols (i.e. Large volume of documents was analyzed to detect the anomaly)	(i). The fair of Whistleblower complaints been ignored, and or the possibility of retaliation. (ii). Bias and fairness of the Al algorithm	(i). Continuous training and efforts to foster a culture of integrity within client organizations. This can help employees understand their rights and feel safe to report misconduct. (ii). Conduct rigorous testing & monitoring to identify and mitigate biases and errors.

Case# 3: PWC's Artificial Intelligence driven anti-money laundering (AML) Compliance

PwC utilizes NICE Actimize for its comprehensive AML solutions, including transaction monitoring and suspicious activity detection, and Tableau for data visualization[81]. These tools were used together to provide comprehensive insights into potential money laundering activities and enhance compliance processes. Actimize uses advanced analytics and machine learning algorithms to analyze transaction data, flagging unusual patterns and behaviors that may indicate illicit activities[81]. This tool can process large volumes of data in real time, enabling PwC to identify and investigate suspicious transactions promptly. To detect suspicious activity, NICE Actimize was also used to analyze customer behavior and transaction history. The tool's machine learning capabilities allow it to learn from past data and continuously improve its detection accuracy[81]. To enhance the understanding and communication of AML findings, PwC utilized Tableau for data visualization.

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[81]PricewaterhouseCoopers (PwC), "AI-driven AML Compliance," https://www.pwc.com/us/en/services/consulting/library/ai-ml-financial-services.html.Accessed April 17, 2024

The Benefit of using Al	Likely challenges identified	Ways the challenges might have been mitigated.
Al allowed for the analysis of large data sets with speed and accuracy. Al was used for real-time monitoring to identify illicit activities as well as customer profiling,	(i). Data protection and privacy concerns.	(i). Strong governance frameworks to address data protection and privacy concerns.
	(ii). Operational challenges including costs of Al acquisitions and employee training.	(ii). Cost should be addressed in the budget and advocate for continuous employee training to foster a culture of integrity.
	(iii). Potential error or false alarm	(iii). Establish robust data management and validation processes to ensure the reliability and accuracy of data input.

Case# 4: Bell Canada: Bell Canada utilizes IBM Watson for its advanced machine learning and natural language processing capabilities to detect and analyze fraudulent activities, and Tableau for data visualization. Bell Canada uses IBM Watson to scrutinize customer data, transaction records, and communication patterns[82]. Watson's machine learning algorithms were trained to identify anomalies and patterns that could indicate fraudulent activities. This includes unusual usage patterns, suspicious account activities, and discrepancies in billing information. By leveraging Watson's ability to process and analyze vast amounts of data quickly, Bell Canada was able to detect potential fraud more accurately and in real-time. For data visualization, Tableau was used. The integration of IBM Watson and Tableau provided a comprehensive view of the fraud landscape, enabling more informed decision-making and faster response times[82]. The integration of IBM Watson and Tableau provided a comprehensive view of the fraud landscape, enabling more informed decision-making and faster response times.

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[82]Bell Canada harnesses machine learning to reduce fraud exposure with Amdocs. Available at https///: www.amdocs.com. Accessed April 22, 2024

The benefit of using AI	Likely challenges identified	Ways the challenges might have been mitigated.
Through real-time monitoring, Bell responded swiftly against fraudsters reducing losses and protecting its customers.	(i). Due to the large customer profile reviewed, there may be data bridge and privacy concerns. (ii). Need for human oversights. (iii). Operational challenges including costs of AI acquisitions and employee training. (iv). Potential error and bias in the algorithm (how was the algorithm trained?)	(i). Need for strong governance frameworks to address data protection and privacy concerns. (ii). Continuous employee training to foster a culture of integrity. (iii). Establish robust data management and validation processes to ensure the reliability and accuracy of data input.

Case#5: PWC Canada's GL.ai for Fraud Detection.

PwC Canada integrated advanced AI tools (GL.ai) into its fraud detection processes to enhance efficiency and accuracy[83]. PwC Canada employs GL.ai for data analysis and anomaly detection in financial records, as well as Tableau for advanced data visualization to present findings in a comprehensible manner. GL.ai utilizes machine learning algorithms to detect anomalies and patterns that may indicate fraudulent activities[83]. The tool's ability to process large datasets and perform complex analyses quickly and accurately allowed PwC to flag unusual transactions for further investigation. GL.ai's machine learning models are trained on vast amounts of historical audit data, which enhances its capability to identify subtle indicators such as usual journal entries, general ledger for anomalies[83].

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[83]Harnessing the power of AI to transform the detection of fraud and error. Available at: https://www.pwc.com/gx/en/about/stories-from-across-the-world/harnessing-the-power-of-ai-to-transform-the-detection-of-fraud-and-error.html. Accessed April 23, 2024

The Benefit of using Al	Likely challenges identified	Ways the challenges might have been mitigated.
Analyzed large data with speed and accuracy.	(i). Since large amount of data was analyzed there may be data bridge and privacy concerns	(i). Need for strong governance frameworks to address data protection and privacy concerns.
	(ii). Operational challenges including costs of Al acquisitions and employee training.	(ii). Continuous employee training to foster a culture of integrity. Budgetary allocation to the acquisition of Al
	(iii). Potential error and bias in the algorithms	(iii). Established robust data management and validation processes to ensure the reliability and accuracy of data input.

Case#6: EY's Forensic AI Platform in Canada deployed AI to Identify potential Expense Fraud: EY has integrated advanced AI tools into its Forensic Accounting services to enhance fraud detection, investigation, and compliance processes[84]. The firm's Forensic AI platform leverages machine learning and data analytics to identify and analyze suspicious activities effectively. EY utilizes MindBridge AI Auditor for data analysis and anomaly detection, and Tableau for advanced data visualization[84]. These tools are combined to provide comprehensive insights into anomalies and streamline forensic investigations. Rather than sampling, MindBridge Ai Auditor was used to analyze the whole data set of the financial records[84]. MindBridge Ai Auditor detected numerous anomalies in the company's expense reports and financial statements, indicating possible fraud. The anomalies were then visualized using Tableau, which highlighted patterns of irregularities across different departments and periods.

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[84]EY Canada Utilizes AI Technology in Forensic Accounting Investigations", EY Canada,
https://www.ey.com/en_ca/news/2021/07/ey-launches-forensic-AI-platform-in-canada-to-help-clients-detect-and-prevent-financial-crimes. Accessed April 23, 2024

The benefit of using Al	Likely challenges identified	Ways the challenges might have been mitigated.
Analyzed expense data 100% and accurately, saving time, and costs, and ensuring compliance.	(i). With the Analysis of large data comes the issue of privacy and the need for Data protection.	(i). Strong governance frameworks to address data protection and privacy concerns.
	(ii). Need for human oversights and in decision making.	(ii). Continuous employee training to foster a culture of integrity and trust in the Al.
	(iii). Operational challenges including costs of Al acquisitions and employee training.	(iii). Established robust data management and validation processes to ensure the reliability and accuracy of data input.
	(iv). Potential error and bias in the algorithms used to model	

Case#7: The Royal Canadian Mounted Police (RCMP), Canada's national police service, has adopted advanced AI tools to enhance its capabilities in fraud detection and investigation. The RCMP utilizes SAS Visual Investigator for data analysis and anomaly detection, and Palantir Gotham for advanced data integration and visualization[85]. The RCMP implemented SAS Visual Investigator to analyze large volume of financial transactions, communication records, and other relevant data sources. SAS Visual Investigator employs advanced analytics and machine learning algorithms to detect anomalies[85].

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[85]How AI is Being Used to Fight Financial Crime in Canada", Deloitte Canada, Available at:
https://www2.deloitte.com/ca/en/pages/financial-crime/articles/ai-fight-financial-crime-canada.html. Accessed April 23, 2024.

Benefit of using Al	Likely challenges identified	Ways the challenges might have been mitigated.
Analyzed large volumes of data, detecting fraud and money laundering.	(i). Data protection and privacy concerns.	(i). Strong governance frameworks to address data protection and privacy concerns.
	(ii). Need for human oversights.	(ii). Continuous employee training to foster a culture of integrity.
	(iii). Operational challenges including costs of Al acquisitions and employee training.	(iii). Established robust data management and validation processes to ensure the reliability and accuracy of data input.
	(iv). Potential error and bias in the algorithms	

Case #8: Deloitte Canada employs Kira Systems for document analysis and review, and Tableau for advanced data visualization[86] These tools were combined to streamline the forensic accounting processes and deliver detailed and actionable insights. Kira Systems was used to automate the analysis and review of large volumes of documents. Kira Systems uses machine learning and natural language processing (NLP) to extract relevant information from contracts, financial statements, and other legal documents[86] This tool significantly reduces the time and effort required for manual document review, enabling Deloitte's Forensic Accountants to focus on higher-value analysis. Kira Systems' ability to analyze historical data, identify and flag anomalies, such as unusual terms in contracts or discrepancies in financial documents, enhanced the firm's fraud detection capabilities. To complement the findings from Kira Systems, Deloitte Canada uses Tableau for data visualization[86].

Leveraging AI, Deloitte was able to automate data analysis processes and uncover fraudulent activities faster, leading to a higher success rate in investigating financial anomalies[86].

[86.] Deloitte Launches AI Institute for Forensic Accounting", Deloitte Canada,
https://www2.deloitte.com/ca/en/pages/forensic/articles/Deloitte-ai-institute-for-forensic accounting.html. Accessed April 23, 2024

Benefit of using Al	Likely challenges identified	Ways the challenges might have been mitigated.
Analyzed large volume of documents using Al. Improved prevention and detection of fraud. Automation of data analysis brings about efficiency and effectiveness.	(i). Data protection and privacy concerns.	(i). Strong governance frameworks to address data protection and privacy concerns.
	(ii). Operational challenges including costs of Al acquisitions and employee training.	(ii). Continuous employee training to foster a culture of integrity.
	(iii). Potential error and bias data used for the algorithms	(iii). Established robust data management and validation processes to ensure the reliability and accuracy of data input.
		(iv). Sound ethical and regulatory framework

Case#9: The CRA employs SAS Analytics for advanced data analysis, IBM Watson for natural language processing and machine learning, and Tableau for data visualization. These tools work together to provide comprehensive insights into tax evasion and fraud cases, facilitating thorough and efficient investigations[87].

The CRA implemented SAS Analytics to analyze taxpayer data, financial transactions, and other relevant information. SAS Analytics uses advanced statistical methods and machine learning algorithms to detect patterns and anomalies indicative of tax evasion or fraud[87]. This tool enables the CRA to sift through large datasets to identify discrepancies, unusual behaviors, and other red flags that warrant further investigation.

The CRA uses IBM Watson to process unstructured data, including emails, social media posts, and other forms of communication[87]. Watson's natural language processing (NLP) capabilities allow it to extract relevant information and identify suspicious activities from vast amounts of textual data. Additionally, Watson's machine learning algorithms continuously improve the accuracy of fraud detection by learning from past cases and adapting to new patterns of tax evasion[87]. To improve the understanding and communication of findings, the CRA uses Tableau for data visualization.

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[87]Canada Revenue Agency Embracing AI to Catch Tax Cheats", BNN Bloomberg, https://www.bnnbloomberg.ca/canada-revenue-agency-embracing-AI-to-catch-tax-cheats-1.1572845. Accessed April 24, 2024

Benefit of using AI	Likely challenges identified	Ways the challenges might have been mitigated.
Used AI to analyze data, detect patterns and tax evasions more accurately, and analyze financial transactions comprehensively with speed.	(i). Data protection and privacy concerns. (ii). Potential error and bias in the data algorithms	(i). Strong governance frameworks to address data protection and privacy concerns. (ii). Continuous employee training to foster a culture of integrity. (iii). Established robust data management and validation processes to ensure the reliability and accuracy of data input.

Case#10: KPMG Canada employs Nalytics for advanced data analysis and Power BI for data visualization[88]. These tools work synergistically to enhance KPMG's Forensic Accounting processes[88]. Nalytics leverages AI and natural language processing (NLP) to sift through structured and unstructured data, including financial statements, emails, contracts, and transaction records[88]. By analyzing textual data and identifying keywords, trends, and anomalies, Nalytics helps KPMG pinpoint potential financial irregularities and suspicious activities. Power BI's intuitive dashboards and interactive reports allow KPMG's Forensic Accountants to visualize complex financial data and trends[88].

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[88]KPMG Canada Launches AI-Driven Forensic Accounting Services", KPMG Canada, https://home.kpmg/ca/en/home/insights/2021/05/kpmg-canada-launches-AI-driven-forensic accounting-services.html. Accessed April 25, 2024

The benefit of using Al	Likely challenges identified	Ways the challenges might have been mitigated.
Used Al to analyze complex financial data and detected anomalies with speed.	(i). Data protection and privacy concerns.	(i). Strong governance frameworks to address data protection and privacy concerns.
	(ii). Need for human oversights in decision making	(ii). continuous employee training to foster a culture of integrity.
	(iii). Operational challenges including costs of Al acquisitions and employee training.	(iii). Established robust data management and validation processes to ensure the reliability and accuracy of data input.
	(iv). Potential error and bias in the algorithms	

5.1.1 __Summary of the Interviews:__

As noted earlier, a total of 3 interviews were conducted with industry experts to complement the 10 cases that were already analyzed. Appendix 1 displays the questions posed and the derived purpose or theme. Some of the interviewees preferred not to be quoted due to the nature of their work. In other to protect their identity, I have organized the interview summary into columns. These columns highlight the impact of Al adoption on the organization, the advantages and disadvantages of using Al, ethical concerns and laws that could arise, and general comments made by the interviewee.

Impact of Al adoption	Advantages and drawbacks of using Al	Rules and Ethical Concerns	General comments
(i). Al is another tool like Excel that FA can use to reduce time and cost of engagement. (ii). There is a need for FAs to get acquitted with it as it has come to stay. (iii). Workers in some routine tasks may need to be laid off, and training and upskilling may be necessary.	(i). Capacity to quickly and accurately analyze large amounts of data while freeing up the FA to concentrate on other tasks. **Drawbacks:** (i). The FA's finding may be deemed inadmissible in court due to difficulty providing a coherent explanation of how a conclusion was reached. (ii). Currently, most Canadian organizations do not use it extensively.	(i). Data algorithmic biases could result in spinoffs. (ii). Issues with Data privacy (privacy of data is not guaranteed). Too much information is obtained and used without consent. (iii). Reliability of results arising from biased data and algorithms. (iv). No trial by ambush (parties need to know in advance that Al was used)	(i). Al is comparable to another product, like Excel that an FA can use to increase efficacy and efficiency of his work. (ii). FAs ought to keep doing what they do well. Al will never take our job.

	(iii). Adoption may be delayed by skepticism that Al is overhyped and that humans are being replaced. (iv). Thinking that some conventional data mining techniques are superior to Al. (v). The cost of acquiring and deploying Al is significant, as is the requirement for staff training and upskilling.	(iv). Need for regulators to develop laws at the same pace as Al and not lag. (v) difficulty in explaining criteria for sampling and how a conclusion was reached in some cases where Al was used.	

5.2.0. **Results and Discussions.**

My online search showed that most of the big accounting and audit firms have a separate Forensic Accounting Department; most of those departments are located in Ontario.

Al appeared to be more of a paradigm shift than a technology; I had to sift through a deluge of information on the internet to find information that was relevant to my literature review.

The examination also revealed a trend: the use of Al varies throughout businesses, regions, and sectors. Smaller businesses are more likely to investigate or not pursue Al at all, whereas larger businesses are more likely to incorporate Al into their daily operations. Large companies that use Al have seen improvements in process speed and accuracy.   Interviews with business leaders who said Al was a tool that aided in the quick processing of vast amounts of data, allowing them to concentrate on analysis and decision-making, further corroborated this.

Industry insiders believe that Al is especially helpful for handling unstructured data.   Al can automate repetitive tasks, which lowers costs and improves operational effectiveness and efficiency. Large firms utilizing Al will seem to be benefiting from the adoption for these reasons.

Some interviewees, however, felt that Al was overhyped, and that traditional Forensic Accountants still employed superior data mining technologies for their work. Even though there might be some useful data mining techniques, I think it's important to focus on the areas where Al seems to improve the efficacy and efficiency of the FA's work. Large data analysis and transaction automation are two examples of areas that will save time and money while freeing up the Forensic Accountant's time to concentrate on making decisions. Raising awareness about the use of Al regularly could result in higher adoption rates. Discouragement at early criticism shouldn't be the cause because Al might be all that remains in the future.

It was critical to establish an ethical and legal foundation for using Al. Nevertheless, additional frameworks and rules are being created. Examples include the Federal Court's recommendations for the use of Al in Canada, the

proposed bill C-27 by AIDA, and the recent European comments regarding the ethical use of Al and President Biden's executive order. All of these along with the COSO ERM and Rest model should make using Al safer and possibly enhance its acceptance rate in Canada. Al will always be a useful tool for Forensic Accountants.

Among the FAs interviewed, 67% representing 2/3 of the people interviewed stated that Al was not used at their company. Some of the given reasons include the overhyped of Al, the superiority of traditional data mining techniques over Al, and the inability of Al to rationally explain conclusions in court. Consequently, the court will not admit into evidence the work of an FA using an Al-enabled tool that fails to disclose its conclusion in a way that an end user can understand. And that FAs must adhere to our core values. The early acceptance rate seems to be impacted by this skepticism, which is consistent with previous research showing that Canada's adoption rate of Al is lower than that of the United States or other industrialized economies of a comparable caliber.

When used to model, the probable problem of bias in the training procedure in most Al methods could result in spinoffs. To build trust when utilizing Al, it could be necessary to be inclusive and ensure proper supervision by human beings. Additionally, to guarantee data accuracy and dependability, strong data management and validation procedures must be established.

All of the interviewees agreed that Artificial Intelligence (AI) will never fully replace humankind which is unquestionably accurate given that humans are in charge of the Al's supervision and decision-making. Thus, it would be accurate to state that Forensic Accountants shouldn't worry about Al taking their employment and should instead keep doing the task for which they are most renowned. Another respondent complained about the inability to provide evidence of how data samples were selected, or conclusion reached in front of the judges. This could be just another factor contributing to Al's sluggish adoption rate. The Court expects the FA to explain the process of reaching a conclusion when providing testimony. The work of an FA who uses an Al-enabled tool and does not reveal how a conclusion was reached, in a way that an end user can explain in court will not be admitted into evidence by the court. For the time being, these obstacles could significantly hinder Forensic Accountants from quickly deploying Al. In the United States, there have been proposals to change the rule of evidence to allow for the use of Al. One should anticipate that FA's practices will continue to use Al sparingly till these are completed.

For now, governance seems not fully equipped to deal with the change this fast, and that may explain why regulation is lagging. The first step towards a new regulatory system, Bill C-27, aims to steer Al innovation positively and promote the responsible adoption of Al technologies by Canadians and Canadian businesses[56]. The Act has collaborated with international partners like the EU and the US to harmonize strategies, guaranteeing global protection for Canadians and International recognition of Canadian firms for meeting robust standards. The Artificial Intelligence and Data Act in Canada, Bill C-27, has successfully passed its second reading. It is important for practitioners to stay updated on its provisions.

Furthermore, Canada with 13 other countries is one of the founding members of The Global Partnership on Artificial Intelligence(GPAI)[55]. The GPAI and the OECD are all working together with experts to enhance and formulate policies that will ensure the safe adoption and ethical use of Al[60].

The Federal Court of Canada has issued guidelines about the use of Al in judicial processes, even though the court does not permit trials by ambush. For instance, it mandates that parties notify one another and the court if they have prepared any document that is filed to the court using content created by Al.

Early research in the United States suggested modifying the Daubert rule of evidence to allow for the use of Al. The Federal Court of Canada recently released rules that demonstrated how artificial intelligence is still a top concern in the legal field. To promote the quick acceptance of Al, more extensive rules, and changes to the rule of evidence are necessary. The use of Al will continue to be viewed with skepticism until this is accomplished because the judge frequently relies on the FA to support the court by outlining the reasoning behind a result for the judge to make decisions. One anticipates that things will improve over time and that Al's usage will rise.

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[55]The Global Partnership in Artificial Intelligence Available at: https://gpai.ai/# Accessed May 24, 2024

[56]Artifificial Intelligence and Data Act(AIDA): https://ised-isde.Canada,ca/site/innovation-better-Canada/en/artificial-intelligence-and-data-act-aida-companion-document. Artificial Intelligence and Data Act (canada.ca) Accessed May 24, 2024

[60]https://oecd.ai/en/ai-principles. AI Principles Overview - OECD.AI. Accessed May 24, 2024

I noted a few operational problems, including the need for human oversight, insufficient talent, concerns about data protection and privacy, and the high acquisition costs associated with adopting Al methods.

For now, it appears there is no playbook yet. So, there are no rules. Canada may be adopting a conservative approach to Al use. All these explain the slow adoption rate in Canada. The United Nations has recognized privacy as a human right, which raises ethical issues[61]. Given the delicate nature of these issues, I believe it is crucial to examine them closely and their implications for the field of Forensic Accounting. Consequently, I address the ethical implications of Al in Forensic Accounting procedures in a separate subsection 5.2.1.below.

Throughout the interview, practitioners reaffirmed the majority of the challenges that were highlighted as the primary obstacles to the adoption and application of Al in FA practices. It was mentioned that Al might make algorithmic bias more pronounced. Due to the self-replicating nature of Al's algorithms, any bias in the algorithm will have an impact on how reliable the results are. In contrast, any human-introduced bias in the traditional technique may be readily addressed; this is not the case with Al. An additional explanation of this was covered in subsection 5.2.1.

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[61]The UNESCO Recommendation on Ethical use of Al: https://www.dataguidance.com/opinion/international-unesco-recommendation-ethics#:~:text=The%20Recommendation%20proposes%20a%20global,%2C%20society%2C%20and%20the%20environment. Accessed May 24, 2024

5.2.1   **<u>Identified Moral Dilemmas and how they Affect Forensic Accounting Procedures</u>**

I believe it is important to look more closely at the ethical issues raised and their ramifications for Forensic Accounting because of how delicate they are. Ethics needs to be ahead or at least at par and not lag. Norms and values should drive ethics, dictating what we should and should not do.

From this project, it was obvious that there was a need for regulation for the ethical use of Al. Early studies by Othmar Manfred Lehner, et al (2022)[16] identified the following ethical challenges objectivity, privacy, transparency, accountability, and trustworthiness which were similar to the ethical challenges identified in the case study, interviews, and the various responses I received to my questions from my attending the Upper Bound Ai Conference in Edmonton.

The following significant ethical difficulties may impact the use of Al in forensic accounting practices: objectivity, privacy, transparency, accountability, and trustworthiness. A stable framework for ethical decision-making, based on Rest's component model antecedent, had earlier been used by Othmar Manfred Lehner, et al (2022)[16], to summarize this relationship. Here is a synopsis of it.

As was earlier indicated, **objectivity** and associated bias issues were one of the five obstacles to Al-based ethical decision-making. This was a prominent and consistent finding in the interviewee's responses as well as the case study. Upon closer examination of the settings, it was found that the majority of ethical dilemmas involving Al-based decisions were mostly caused by the large data and the algorithms that underpin these conclusions. However, because these algorithms are the result of human labor and the data they use is historical and frequently chosen by humans, bias may exist[16]. Therefore, the questions that should be asked are how humans can create objective algorithms or how to ensure that the data that is put into the algorithms is free of bias.

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[16]Othmar Manfred Lehner, Kim Ittonen, Hanna Silvola, Eva Str€om, and Alena Wuhrleitner (2022) Artificial intelligence-based decision-making in accounting and auditing: ethical challenges and normative thinking. Available at:https://www.emerald.com/insight/content/doi/10.1108/AAAJ-09-2020-4934/full/pdf?title=artificial-intelligence-based-decision-making-in-accounting-and-auditing-ethical-challenges-and-normative-thinking Accessed May 19, 2024.

The moral consciousness of the human professionals who design and train the Al systems will determine the answers to these problems. The second and third components of Rest's model- moral judgment and moral motivation will be mostly affected by the challenge to objectivity; as illustrated below, both will be faulty in the presence of biased data or algorithms.

Using Al-based decision-making in Forensic Accounting procedures, there may be privacy and data protection issues due to the rapid and uncontrolled use of huge amounts of data in Al-based systems. Al's self-tuning nature allows it to evolve and select data sources autonomously, using personal information at a pace and power that users may not readily understand or find transparent.

One may advise that Blockchain's distributed ledger and safe data storage be used for privacy and data protection; Blockchains offer data storage that is encrypted and impervious to tampering, enabling the tracking of data entry and modification[89],[90]. This type of traceability is critical for trust-building, storage data transparency, and auditing.

People have the right to request a human review of Al's decision-making process in the European Union under the GDPR, which is similar to the PIPEDA, to ascertain whether the system made a mistake. This imposes a legal duty on the company to use judgment, necessitating the explicability of judgments made using Al[16]. Such decisions would require transparency into the inner workings of the algorithms that made the decisions, as well as traceability of the elements that influenced the decision which Block Chain will provide.

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[89]Cai, C.W.(2021), "Triple-entry accounting with blockchain: how far we have come?" Accounting and Finance, Vol. 61 No 1 Pp.71-93

[90]McCallig, J., Robb, A. and Rohde, F.(2019), "Establishing the representational faithfulness of financial accounting information using multiparty security, network analysis and a blockchain", International Journal of Accounting Information systems, Vol. 33, Pp.47-58.

[16]Othmar Manfred Lehner, Kim Ittonen, Hanna Silvola, Eva Str€om, and Alena Wuhrleitner (2022) Artificial intelligence-based decision-making in accounting and auditing: ethical challenges and normative thinking. Available at:https://www.emerald.com/insight/content/doi/10.1108/AAAJ-09-2020-4934/full/pdf?title=artificial-intelligence-based-decision-making-in-accounting-and-auditing-ethical-challenges-and-normative-thinking. Accessed May 19, 2024.

One way to think of transparency as an ethical dilemma is to see it as a prerequisite for other ideas like accountability and trust. Typically, concerns about data transparency revolve around the creation, collection, manipulation, and use of information (Albu and Flyverbom, 2016)[91.]

Ristolainen (2017)[92.] refers to neural networks for Al as black boxes due to their reliance on secret code and structures that technology companies are reluctant to reveal to the public. Discrete, opaque hardware devices occasionally implement these codes and structures (Ristolainen (2017)[92]. Deep reinforcement-based learning Al draws inspiration from biology and roughly models the human brain (Sun, 2019; Sun and Vasarhelyi, 2018)[93,94]. As a result, a deep learning Al system that runs on neural networks continuously adjusts its behavior in reaction to outside cues. These environmental effects are, nevertheless, rather random, and quite complex(Glikson and Woodley 2020)[95.]

[91]Albu, O. B. and Flyverbom, M.(2016), "Organizational transparency: Conceptualizations, conditions, and consequences", Business and Society, vol 58 No.2 Pp.268-297

[92]Ristolainen, K. (2017), "Predicting banking crises with artificial neural networks: the role of nonlinearity and heterogeneity" The Scandinavian Journal of Economics, Vol 120 No.1, PP .31-62

[93]Sun, T. (2019), "Applying deep learning to audit procedures: an illustrative framework", Accounting Horizons, Vol.33 No.3 Pp89-109.

[94]Sun, T. and Vasarhelyi, M.(2018), "Embracing textual data analytics in auditing with deep learning", The International Journal of Digital Accounting Research, Vol.18, pp.49-67.

[95]Glikson, E. and Woodley, A. W. (2020), "Human trust in artificial intelligence: a review of empirical research", Academy of Management Annals, Vol.14 No.2, PP.627-660.

This means that Al's actions in this situation are neither transparent nor deterministic (Glikson and Woodley 2020)[95]. It is also challenging to identify any potential biases because of Al's lack of transparency, which can originate from the data used to train algorithms or from the algorithm's code itself. To determine the origin of the detected bias, traceability, and continuous monitoring will therefore be required.

Once more, it is critical to remember that, should the decision-making processes for an algorithm be made accessible, individuals may be able to readily manipulate the (self-learning) algorithms, and based on this knowledge intended outcomes can be predicted (Arnaboldi et al. 2017b; Leicht-Deobald et al. 2019)[96,97]. This affects trust, leaving us with another question: who do we tell secrets to?

It is possible to view **transparency** as the beginning of developing moral awareness and it helps to build trust and prevents others from evaluating different decision outcomes as would be required for a moral incentive[16]. Transparency as a problem thus interferes with several elements of the Rest's model. It influences moral behavior and serves as a significant precondition for accountability and trustworthiness.

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[95]Glikson, E. and Woodley, A. W. (2020), "Human trust in artificial intelligence: review of empirical research", Academy of Management Annals, Vol.14 No.2, PP.627-660

[96]Arnaboldi, M., Busco, C. and Cuganesan, S.(2017b), "Accounting, accountability, social media and big data: revolution or hype?", Accounting, Auditing and Accountability Journal, Vol.30 No.4, PP.762-776

[97]Leicht-Deobald, U., Busch, T., Schank, C., Weibel, A., Schafheitle, S., Wildhaber, I., and Kasper, G. (2019). "The challenges of algorithms-based HR decision-making for personal integrity" Journal of Business Ethics, Vol 160 No.2., PP337-392

[16]Othmar Manfred Lehner, Kim Ittonen, Hanna Silvola, Eva Str€om, and Alena Wuhrleitner (2022) Artificial intelligence-based decision-making in accounting and auditing: ethical challenges and normative thinking. Available at:https://www.emerald.com/insight/content/doi/10.1108/AAAJ-09-2020-4934/full/pdf?title=artificial-intelligence-based-decision-making-in-accounting-and-auditing-ethical-challenges-and-normative-thinking. Accessed May 19, 2024.

Accountability: The first step in advancing moral Al-based systems might be to realize that human responsibility extends beyond the use of Al algorithms. Algorithms incorporate many human influences, such as the selection of training data, semantics, and increasingly visual interpretation, as well as Forensic Accountant criteria decisions[16]. As a result, ethical algorithmic responsibility must consider algorithms as products of human invention and interaction as well as moral intent[16], which includes the intent of any institutional or group procedures that may have an impact on the data input into the design of an algorithm[16]. Thus, it is imperative that the good governance of Al technologies deeply incorporates the delegation of tasks between accountants/auditors and specialists (Griffith, 2020)[16,98]. In a typical organizational context, accountability and human resources have a close relationship, but the relationship becomes less clear-cut when it comes to Al-based decision-making. Therefore, the first, third, and fourth parts of Rest's model are impacted by the accountability dilemma[16]. Humans must first adopt moral consciousness. And in order to make any ethical decisions, we must first hold data suppliers and algorithm creators accountable. Then, the degree of accountability will depend on personal interests, which in turn affects any moral motive in human-machine situations. Again, Al decisions are based on these three elements-human-made algorithms used within Al, partially human-supplied, partially Al-selected data as a basis, and the assignment and division of tasks between humans and Al as determined by humans[16]. Any normative demands for moral behavior must recognize accountability as rooted in these three elements (Lawrence and Phillips, 2019; Orlikowski and Scott, 2008)[99,100,16]

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[98]Griffith, E. E.(2020), "Auditors, specialists, and professional jurisdiction in audits of fair values" Contemporary Accounting Research, Vol.37 No.1 pp.245-276

[99]Lawrence, T.B. and Phillips, N. (2019), Constructing Organizational Life: "How Social-Symbolic Work Shapes Selves, Organizations, and Institutions", Oxford University Press, Oxford.

[100]Orlikowski, W.J. and Scott, S.V. (2008), "Sociomateriality: Challenging the separation of technology, work and organization", Academy of Management Annals, Vol.2 No.1, PP.433-474.

[16]Othmar Manfred Lehner, Kim Ittonen, Hanna Silvola, Eva Str€om, and Alena Wuhrleitner (2022) Artificial intelligence-based decision-making in accounting and auditing: ethical challenges and normative thinking. Available at:https://www.emerald.com/insight/content/doi/10.1108/AAAJ-09-2020-4934/full/pdf?title=artificial-intelligence-based-decision-making-in-accounting-and-auditing-ethical-challenges-and-normative-thinking. Accessed May 19, 2024.

Most people understand being **trustworthy** as being willing to expose oneself to another's vulnerability (Martin 2018)[101]. Technology's concept and design might affect how trustworthy consumers believe it to be[16]. The majority of opinions regarding trust issues about Al are mostly focused on the biases resulting from algorithms. These biases may result from problems with accountability, responsibility, unethical use of shared data, and openness (Glikson and Woodley, 2020)[16,95]. According to a survey conducted by (Davenport and Kokina, 2017)[102] among US consumers, respondents don't usually trust Al's decisions. The main cause of this is that most individuals are ignorant of how sophisticated algorithms operate or draw conclusions. As attested to by all my interview respondents, the truth is that Algorithms make use of data and if the data is biased it will affect the conclusions. Furthermore, studies by Jarrah (2018)[103] demonstrate that employee trust in Al is a significant component of the effectiveness of Al system integration in the workplace. Therefore, the level of FA trust in Al will dictate the adoption and use of Al in Forensic Accounting practices.

As a result, moral behavior is required and is the beginning of trustworthiness. Decisions related to accounting will not be made if people do not trust Al's background decision-making procedures. Furthermore, if humans are to have any doubt about Al's ability to draw the correct conclusions and make the right decision, it could be compromised if these doubts are based on irrational or rational grounds, such as Al's refusal to follow automated orders or the absence of moral standards in its decisions. Accordingly, in the Rest paradigm, trust stimulates moral behavior.

[101]Martin, K.(2018), "Trust and online market maker: a comment om Etzioni's cyber trust", Journal of Business Ethics Vol.156 No.1, PP.21-24

[95]Glikson, E. and Woodley, A. W. (2020), "Human trust in artificial intelligence: review of empirical research", Academy of Management Annals, Vol.14 No.2, PP.627-660

[102]Davenport, T.H., and Kokina, J.(2017), "The emergence of artificial intelligence: how automation is changing auditing", Journal of Emerging Technologies in Accounting, Vol.14 No.1, PP.115-122.

[103]Jarrah, M.H.(2018), Artificial intelligence and the future of work: "human-Al symbiosis in organizational decision making", Business Horizons, Vol.61 No.4, Pp577-586.

[16]Othmar Manfred Lehner, Kim Ittonen, Hanna Silvola, Eva Str€om, and Alena Wuhrleitner (2022) Artificial intelligence-based decision-making in accounting and auditing: ethical challenges and normative thinking. Available at:https://www.emerald.com/insight/content/doi/10.1108/AAAJ-09-2020-4934/full/pdf?title=artificial-intelligence-based-decision-making-in-accounting-and-auditing-ethical-challenges-and-normative-thinking. Accessed May 19, 2024.

As shown below, not every ethical obstacle that has been found has an identical impact on Rest's four-component model for making ethical decisions. While some have a moderate impact, others have a more significant impact and others impacted more than one of the four components. Trustworthiness can be viewed as the activator and a requirement to overcoming any of them.

Fig1: Interrelationship between Identified Al ethical challenges and Rest's Four Component Model (Adapted from Othmar Manfred Lehner et al [2022])
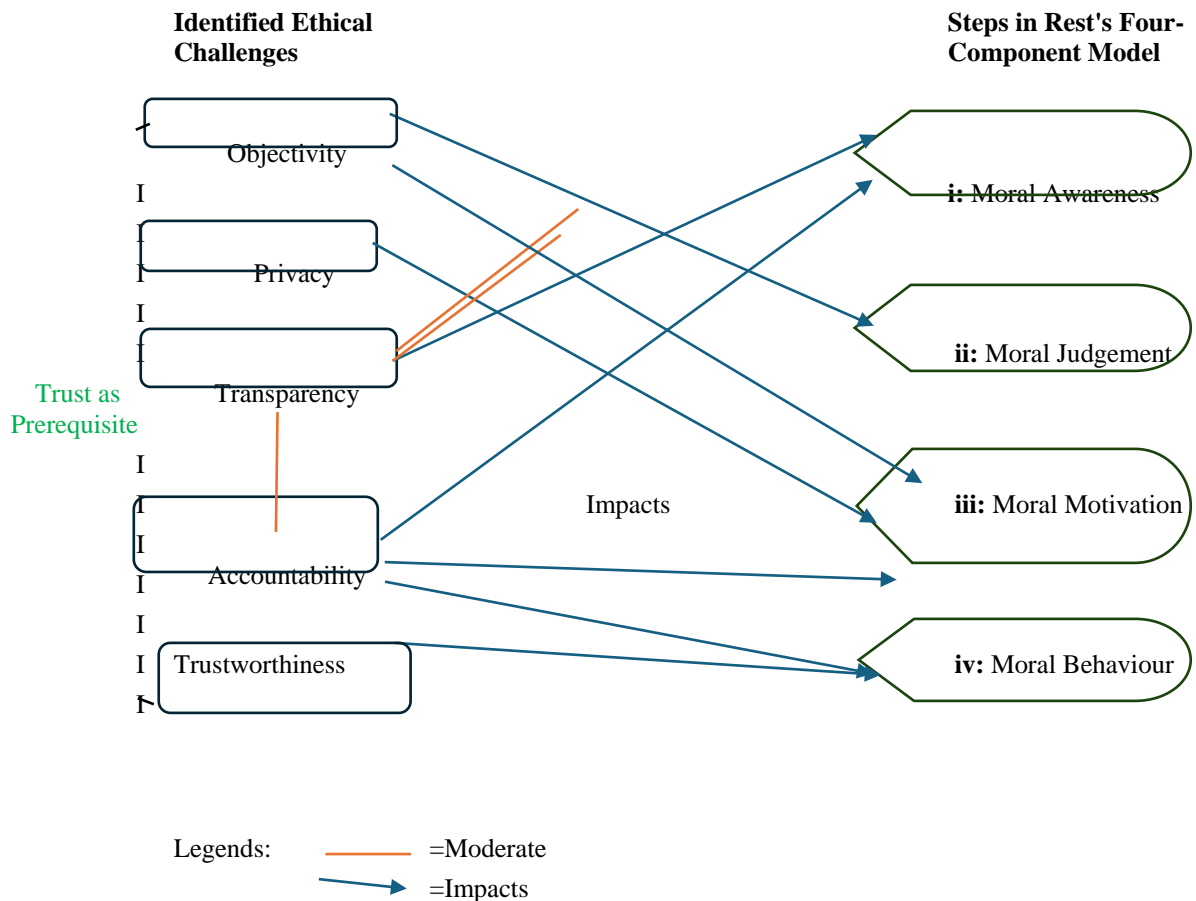
[16]Othmar Manfred Lehner, Kim Ittonen, Hanna Silvola, Eva Str€om, and Alena Wuhrleitner (2022) Artificial intelligence-based decision-making in accounting and auditing: ethical challenges and normative thinking. Available at:https://www.emerald.com/insight/content/doi/10.1108/AAAJ-09-2020-4934/full/pdf?title=artificial-intelligence-based-decision-making-in-accounting-and-auditing-ethical-challenges-and-normative-thinking Accessed May 19, 2024

5.2.2. __Practical Implications of the Study:__

As Al develops further, post-study Forensic Accounting may change as well, with consequences for policy and training formulation. Primarily, it is imperative that Forensic Accountants receive training and familiarize themselves with Al's methods to enhance their work. This will guarantee that technology does not supplant the FA. By hosting regular workshops where professionals and business executives gather to talk about the latest developments in Al technology and how Al may benefit their companies, the majority of developed economies will continue to increase awareness among their practitioners. One can present a comprehensive picture of Al's influence on Forensic Accounting by taking an interdisciplinary approach and combining insights from computer scientists on Al's technological constraints and attorneys on moral and ethical problems. These kinds of conferences include the annual Al Seoul Summit, the annual Machine Can See Conference in Dubai, and the Upper Bound Al conference hosted by the Alberta Machine Learning Intelligence Institute (Amii) in Edmonton, Canada. By participating in these conferences, experts can provide regulators with insightful policy recommendations that will aid in the development of suitable regulations that will hasten the use of Al. To make users more aware, these conferences should be held more regularly around the globe.

To allow the use of Al in their studies, FA would need to modify their expertise and training since Al might only be a future tool for FA.

Forensic Accountants need to consider how Al models can fit into their existing processes as they await more regulatory modifications to allow for new Al technology.

Additionally, Forensic Accountants may receive Al training by adding specific courses or modules to already-existing certification programs. An alternative might be collaborations with tech companies to offer practical training sessions or virtual reality representations of Al tools in use.

Finally, before adopting Al, organizations should have a clear vision about what they are planning to achieve by adopting Al and have key performance indicators to measure its performance; Firms should invest in the right data and be agile in keeping up with technology as the technology is changing very fast.

6.0 **Suggestions and Final Thoughts**

[i].   In the current digital era, Al offers excitement for growth. New companies will develop tools that will help Forensic Accountants. Likely, Forensic Accounting procedures will eventually incorporate Artificial Intelligence (AI) technology.   Therefore, it is essential for Forensic Accountants to comprehend how Artificial Intelligence is affecting Forensic Accounting in order to modify their methods and expertise and maintain their applicability in a rapidly changing technological environment. This will entail raising awareness and providing training.

[ii].   Since AI adoption in Forensic Accounting has the potential to greatly increase productivity and cut costs, Forensic Accountants should concentrate on how Al might improve their work. Artificial intelligence (AI) improves overall investigative outcomes while optimizing resource usage by freeing Forensic Accountants time to concentrate on difficult analysis by automating repetitive operations and streamlining processes. Therefore, large firms will need to grow in-house talents as Al may be an amplifier of the talents the big firms have, and smaller firms should recruit FA with Al's knowledge.   Automation is coming big time, FA will be better off growing with Al, by knowing how to use them and not shying away from it.

[iii]. Undoubtedly, as AI becomes more sophisticated, new hazards will inevitably arise, like data privacy issues and fraud powered by Al. To be able to minimize these new risks, promote proactive risk management techniques, and protect financial integrity, the FA must be ahead of the curve and predict how these risks will change.

[v].   The results of this study have consequences not just for Forensic Accountants but also for professional development programs and educational courses in Forensic Accounting. Future Forensic Accountants will be well-prepared to use Al technologies in their jobs if education and training programs include Al-related knowledge and abilities. Also, I foresee a radical transformation in how people will be educated.

People will be able to easily grasp education at a faster speed and there will be incremental improvements in education, and education may become more personalized.

[vi]. Upon closer inspection, it is crucial to keep creating moral standards that will guarantee transparent, auditable algorithm designs, achieve reliability, and promote Al's moral adoption.

7.0   <u>**Future Research**</u>

Since this is a new subject, there are some areas that are essential to developing the discipline and making sure Forensic Accountants can use Al to their full potential. Therefore, comprehending Al applications, resolving emerging hazards and ethical considerations, and utilizing Al's assisted search and patent matching should be the main goals of future research on the effect of Al adoption on Forensic Accounting.

APPENDIX 1

Interview Questions and Purpose for Asking the Questions

		Question	**Theme (purpose question was asked)**
1		Do you use Al?	Impact of adoption, benefits, and tools used.
2		How long have you been using Al?	Impact of adoption, benefits, and tools used.
3		Why is your organization using Al?	Impact of adoption, benefits, and tools used.
4		What are the challenges of Al?	Challenges of Adoption & drawbacks
5		What is the likely misconception of Al?	Challenges of Adoption & drawbacks
6		What do you think are the limitations of Al?	Challenges of Adoption & drawbacks/Ethics
7		What ethical issues do you think can arise from using Al?	Rules, regulations, and ethical concerns
8		How does Al's adoption in FA align with Canadian financial regulatory compliance requirements and how does this compare internationally?	Rules, regulations, and ethical concerns
9		What ethical issues do you foresee from using Al?	Rules, regulations, and ethical concerns
10		Do you think Al can replace the need for human beings?	Skills Requirements for Forensic Accountants
11		What skills do you think will be necessary for Forensic Accountants in the future?	Training & Professional Development needed for future Forensic Accountants
12		Any general comments?	Tailored for interview closing & general comments.

Terminology Definitions and Important Ideas

The definitions improve clarity and comprehension when addressing the impact of AI on forensic accounting processes in Canada and they provide a foundational grasp of important concepts related to the research issue.

[i]. **Artificial intelligence (AI)** is the term used to describe how computers, especially computer systems, may simulate human intelligence processes. AI systems can carry out operations like data processing, pattern recognition, and decision-making, and they frequently can grow and learn from experience.

[ii]. **Forensic Accounting:** To identify, investigate, and stop financial fraud, misbehavior, and irregularities within companies, forensic accounting applies accounting concepts, investigative methods, and legal expertise.

[iii]. **Adoption of AI:** To improve productivity, efficacy, and results, companies and professionals adopt AI by incorporating AI technologies into their practices, operations, and decision-making procedures.

[iv]. **AI utilization:** This refers to the use and use of AI technologies in particular situations, including forensic accounting procedures. This covers activities including employing AI tools and algorithms for data analysis, anomaly detection, fraud identification, and decision assistance.

[v]. **Efficiency:** In the context of artificial intelligence (AI) and forensic accounting, efficiency is the capacity of AI technologies to simplify workflows, automate repetitive operations, minimize manual labor, and maximize resource usage, resulting in quicker and more economical investigative processes.

[vi]. **Effectiveness**: In forensic accounting, effectiveness is the extent to which artificial intelligence (AI) technologies meet predetermined goals, like precisely identifying financial abnormalities, spotting fraudulent activity, and offering useful information for making decisions.

[vii]. **The ethical implications** and concerns surrounding the introduction and application of artificial intelligence (AI) in forensic accounting are considered ethical considerations. This covers matters like algorithmic bias, fairness, accountability, transparency, and data privacy as well as the moral application of AI in financial investigations.

[viii]. **Professional Development:** The term "professional development" describes the ongoing education, training, and skill-building that forensic accountants engage in to improve their abilities, adjust to new technologies like artificial intelligence, and continue to be productive and relevant in their positions.

[ix]. **Regulatory Compliance:** Ensuring the appropriate and legal application of AI tools and algorithms requires compliance with legal regulations, standards, guidelines, and regulatory frameworks controlling the use of AI technologies in forensic accounting processes.

[x]. **Industry Competitiveness**: The capacity of forensic accounting specialists and organizations to effectively use AI technology, develop their processes, improve client offers, and keep a competitive edge in the market is referred to as industry competitiveness.

[xi].   Artificial intelligence (AI) is the term used to describe how computer systems mimic human intellectual functions such as perception, learning, reasoning, problem-solving, and decision-making. Artificial Intelligence (AI) technologies include robots, computer vision, natural language processing, machine learning algorithms, and expert systems (Russell & Norvig, 2022).

[xii].   **Forensic Accounting:** To find financial fraud, misbehavior, or irregularities, forensic accounting applies accounting, auditing, and investigative procedures. To assist with legal processes, regulatory compliance, and fraud prevention initiatives, forensic accountants examine financial records, transactions, and supporting documentation (Wells, 2005).

[xiii].   Fraud detection is the process of spotting and exposing fraudulent activity, such as money laundering, embezzlement, bribery, corruption, and financial fraud. Through data analysis, pattern recognition, anomaly detection, and predictive modeling, AI technologies are essential for improving fraud detection skills (Albrecht et al., 2009).

[xiv].   **Machine Learning (ML):** Machine Learning is a branch of artificial intelligence that uses statistical models and algorithms to teach computers how to analyze data, find patterns, and forecast outcomes without the need for explicit programming instructions. The fields of fraud detection and risk assessment frequently include machine learning (ML) approaches, such as supervised learning, unsupervised learning, and reinforcement learning (Mitchell, 1997).

[xv].   **The goal of the artificial intelligence** field known as "natural language processing" (NLP) is to enable computers to comprehend, interpret, and produce human language. Text analysis, sentiment analysis, speech recognition, and language translation are made easier by NLP technology and are useful for examining unstructured data for forensic accounting reasons (Jurafsky & Martin, 2019).

[xvi].   **The term "Ethical Considerations in AI"** refers to the moral and ethical ramifications of AI technology, encompassing concerns about algorithmic biases, data privacy, accountability, justice, transparency, and the influence on society. When using AI technologies in financial investigations, forensic accountants have ethical problems to overcome (Floridi et al., 2018).

[xvii].   **Regulatory Compliance:** This refers to following the laws, guidelines, and rules that control the usage of artificial intelligence, data security, financial reporting, and fraud avoidance. AI integration in forensic accounting procedures is guided by industry-specific legislation and compliance frameworks like the General Data Protection Regulation (GDPR) (EU, 2016).

[xviii].   **Risk management strategies** include detecting, evaluating, reducing, and keeping an eye on hazards related to the use of AI, data security, algorithmic mistakes, noncompliance with regulations, and fraud risks. Assuring the ethical and secure application of AI technology in forensic accounting requires effective risk management.

APPENDIX 3

GLOSSARY OF TERMS

UNESCO: United Nations Educational, Scientific and Cultural Organization

OECD: The Organization for Economic Cooperation and Development

GPAI: Global Partnership on Artificial Intelligence

AIDA: Canada's Artificial Intelligence and Data Act.

Nalytics: an AI-powered search tool and discovery platform.

Power BI: a business analytics tool for data visualization.

ACL: Audit Command Language Analytics is a data extraction and analysis software tool.

Tableau: a visual analytics platform.

IBM Watson: a computer system capable of answering questions posed in natural language

Relativity trace: A software to help users organize data, discover the truth, & act on it.

GL.ai.: an AI-enabled system that analyzes documents and prepares reports, improving the efficiency and accuracy of audits

MindBridge: An Al-powered risk intelligence for internal controls and audit

SAS Visual: A visual analytics tool.

Kira Systems: Al-powered machine learning models

SAS Analytics: A visual analytics tool.

Palantir Gotham:-An Al-based data solution designed for global defense, and law enforcement agencies. Used to manage and analyze real-time data enabling enforcement agencies to make informed decisions.

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Conference and Webinar attended:

Conference: 2024 Upper Bound Al-organised by Alberta Machine Intelligence Institute(May 21-24,2024)

2024 UPPERBOUND
CONFERENCES PASS

Webinar(May 15, 2024)- Forensic Accounting and Fraud Mitigation-Organized by CPA EDMONTON CHAPTER

🎟 1 x Ticket

🕐 Wednesday, 15 May 2024 from 12:00 p.m. to 1:15 p.m. (MT