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ARTIFICIAL INTELLIGENCE-BASED AUDIT SOFTWARE: TODAY'S REALITIES AND FUTURE VISION

(YAPAY ZEKÂ DESTEKLİ DENETİM YAZILIMLARI: BUGÜNÜN GERÇEKLERİ VE GELECEĞİN VİZYONU)

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ABSTRACT

In today's era of big data, traditional audit methods may not always be sufficient to address the complex risks faced by businesses. At this point, AI-supported audit software (AIAS) emerges as a promising solution to overcome these challenges.

This study aims to comprehensively examine the current state and future potential of AIAS, analyzing the opportunities and challenges arising from the integration of these technologies into audit processes. To achieve this, we investigate the use cases of AIAS across various audit types and sectors, assessing the benefits they offer and the challenges they present.

Additionally, by analyzing the global and local pioneers of AIAS, we identify the factors driving the development of these technologies and uncover future trends. This compilation-based study reveals that AIAS has the potential to make audit processes more efficient, effective, and reliable. However, it also emphasizes the need for careful consideration of issues such as data privacy, algorithmic bias, and ethical implications.

This study underscores the importance of collaboration among auditors, businesses, and regulators to fully harness the potential of AIAS while minimizing potential risks. It advocates investing in a continuous learning and adaptation process. Future research should delve deeper into the impact of AIAS across different sectors and develop recommendations to fully capitalize on the potential of these technologies.

Keywords: Big Data Analytics, Anomaly Detection, Process Automation, Risk Assessment, Artificial Intelligence Assisted Audit Software (AIAS)

Jel Codes: M15, M42, C88, G38, K22, O33, L86

ÖZET

Günümüzün büyük veri çağında, geleneksel denetim yöntemleri, işletmelerin karşılaştığı karmaşık riskler karşısında her zaman yeterli olmayabilmektedir. Bu noktada, yapay zekâ destekli denetim yazılımları (YZDY), bu zorlukların üstesinden gelmede umut vadeden bir çözüm olarak öne çıkmaktadır.

Bu çalışmanın amacı, YZDY'lerin mevcut durumunu ve gelecekteki potansiyelini kapsamlı bir şekilde incelemek ve bu teknolojilerin denetim süreçlerine entegrasyonunun getirdiği fırsatları ve zorlukları analiz etmektir. Bu amaçla, YZDY'lerin farklı denetim türlerinde ve farklı sektörlerdeki kullanım örnekleri incelenmiş, sağladığı faydalar ve getirdiği zorluklar değerlendirilmiştir.

Ayrıca, YZDY'lerin küresel ve yerel pazardaki öncüleri analiz edilerek, bu teknolojilerin gelişimine yön veren faktörler ve gelecekteki trendler ortaya konmuştur. Derleme yöntemi kullanılarak yapılan bu çalışma, YZDY'lerin denetim süreçlerini daha verimli, etkili ve güvenilir hale getirme potansiyeline sahip olduğunu ortaya koymuştur. Ancak, veri gizliliği, algoritma yanlılığı ve etik gibi konuların da dikkatle ele alınması gerektiği vurgulanmıştır.

Bu çalışma, YZDY'lerin potansiyelinden tam olarak yararlanmak ve olası riskleri en aza indirmek için, denetçilerin, işletmelerin ve düzenleyicilerin iş birliği içinde çalışmasının ve sürekli öğrenme ve adaptasyon sürecine yatırım yapmasının önemini

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vurgulamaktadır. Gelecekteki araştırmaların, YZDY'lerin farklı sektörlerdeki etkilerini daha derinlemesine incelemesi ve bu teknolojilerin potansiyelinden tam olarak yararlanmak için çözüm önerileri geliştirmesi faydalı olabileceği sonucuna varılmıştır.

Anahtar Kelimeler: *Büyük Veri Analitiği, Anomali Tespiti, Süreç Otomasyonu, Risk Değerlendirmesi Yapay Zekâ Destekli Denetim Yazılımları (YZDY)*

Jel Kodları: *M15, M42, C88, G38, K22, O33, L86*

1. INTRODUCTION

In today's rapidly digitalizing world, businesses and other organizations generate and process unprecedented amounts of data as they conduct their operations and make decisions. This era of big data presents both significant challenges and opportunities in the field of auditing. Traditional auditing methods may, in certain cases, struggle to analyze large datasets, comprehend complex business processes, and assess rapidly changing risks. These limitations can adversely affect the efficiency and effectiveness of auditing processes, potentially increasing the risks faced by organizations.

Artificial intelligence-based audit software (AIAS) is emerging as a promising solution to overcome these challenges. By leveraging artificial intelligence (AI) and machine learning (ML) capabilities such as big data analytics, anomaly detection, risk assessment, and process automation, AIAS has the potential to make audit processes more efficient, effective, and reliable. This software can alleviate the workload of audit professionals (human auditors) by rapidly and accurately analyzing large datasets, identify risks at earlier stages through the detection of complex patterns, and free up human resources to focus on more strategic tasks by automating routine activities. In this way, AIAS can both enhance the quality of audit processes and contribute to building a safer and more sustainable future for businesses.

This study aims to comprehensively examine the current state and future potential of AIAS, analyzing the opportunities and challenges arising from integrating these technologies into audit processes. To this end, we will investigate the use cases of AIAS across various audit types and sectors, evaluating the benefits and challenges they bring. Furthermore, by analyzing the pioneers of AIAS in both global and local markets, we will identify the factors driving the development of these technologies and uncover future trends.

This study seeks to shed light on new research and applications in this field by taking a holistic view of the current state and future potential of AIAS. In particular, a deeper examination of the impact of AIAS across different sectors is crucial for fully realizing the potential of these technologies. Additionally, the ethical and legal issues arising from the use of AIAS will be a key focus of this study. By proposing solutions to these issues, we aim to ensure that AIAS is used in accordance with ethical principles, thus maintaining the reliability and transparency of audit processes.

This study consists of four main sections. The first section covers the definition and scope of AIAS. The second section examines the pioneers of AIAS in the global and local markets. The third section discusses the challenges of using AIAS and solution proposals for these challenges. The final section discusses the ethical dimension of AIAS and shares thoughts on the future of human-AI collaboration.

2. LITERATURE REVIEW (CONCEPTUAL/THEORETICAL FRAMEWORK)

Artificial intelligence-based audit software (AIAS) is a rapidly developing research area with immense potential in the field of auditing. Studies in this domain help us understand how AIAS is transforming audit processes, the benefits it offers, and the challenges it presents.

Cao et al. (2020) conducted a seminal study examining the current state and future potential of AIAS in audit processes. Their work provides a detailed analysis of AIAS applications in various areas, including big data analytics, anomaly detection, risk assessment, and process automation. The authors emphasize that AIAS has the potential to enhance the efficiency, effectiveness, and reliability of audit processes.

Goh and Woo (2023) present another significant study that explores the impact of AIAS on the auditing profession. They delve into how AIAS is reshaping audit processes, influencing the roles of auditors, and identifying future research directions. The authors highlight the growing importance of AIAS in audit processes and the need for auditors to adapt to these technologies.

Arel et al. (2023) synthesized the literature examining the effects of AIAS on the auditing profession. Their research offers a comprehensive assessment of how AIAS impacts audit processes, the benefits it provides, and the challenges it poses. The authors underscore the increasing significance of AIAS in audit processes and call for further research in this area.

Beyond studies on the integration of AIAS into audit processes, research also explores the applications of these technologies across various sectors. For instance, a report by KPMG (n.d.) notes the widespread adoption of AIAS in the financial services sector, highlighting its potential to expand customer service and create a competitive advantage.

A report published by the World Economic Forum (2020) emphasizes the transformative potential of AI in auditing, suggesting that it can make audit processes more efficient, effective, and reliable.

Alongside these studies, the literature also addresses the challenges and ethical concerns associated with the use of AIAS. Issa et al. (2016) proposed a research agenda for AI applications in auditing, encompassing issues such as data privacy and security, algorithmic bias, ethical considerations, and regulatory compliance.

Jobin et al. (2019) reviewed global studies on AI ethics, underscoring the importance of ethical principles in the development and use of AIAS.

These studies collectively highlight the significance and potential of AIAS in audit processes while also bringing to light the challenges and ethical issues associated with its use. Future research is expected to delve deeper into the integration of AIAS into audit processes, develop solutions to maximize its potential, and ensure its ethical application.

3. METHODOLOGY

This study is a compilation of research examining the current state and future potential of artificial intelligence-based audit software (AIAS). It delves into various aspects of AIAS, including its definition, scope, application in different audit types and sectors, global and local market examples, integration of artificial intelligence into audit processes, future projections, challenges, proposed solutions, and ethical dimensions.

The study begins by elucidating what AIAS is, the technologies it employs, and how it is utilized in audit processes. Subsequently, it provides examples of AIAS use cases across different audit types (e.g., financial, operational, compliance) and sectors (e.g., finance, healthcare, manufacturing, retail). These examples illustrate how AIAS is transforming audit processes and the benefits it brings to businesses.

The next phase of the study examines the pioneers of AIAS in both global and local markets. This analysis reveals the features, capabilities, and areas of use of prominent AIAS in the audit sector, both worldwide and within Turkey.

The final section of the study discusses the challenges associated with the use of AIAS, proposes solutions to address these challenges, and explores the ethical dimension of artificial intelligence in the field of auditing. It emphasizes that issues such as data privacy and security, algorithmic bias, ethical concerns, and regulatory compliance are crucial considerations in the development and use of AIAS.

This compilation study aims to contribute to research and practice in this field by comprehensively addressing the current state and future potential of AIAS. By synthesizing information from various sources, the study elucidates both the opportunities and challenges of integrating AIAS into audit processes. In doing so, it provides a roadmap to help both auditors and businesses utilize AIAS more effectively and harness the full potential of these technologies.

DEFINITION AND SCOPE OF ARTIFICIAL INTELLIGENCE-BASED AUDIT SOFTWARE

Artificial intelligence-based audit software (AIAS) encompasses advanced software solutions that leverage artificial intelligence (AI) and machine learning (ML) technologies to enhance efficiency and effectiveness in audit processes (Cao et al., 2020). These software solutions not only analyze vast datasets but also have the potential to revolutionize audit processes by employing diverse AI techniques, such as natural language processing (NLP), process mining, and predictive analytics. AIAS boasts a wide array of capabilities, including anomaly detection, risk assessment, and decision-support (KPMG, 2024). By enabling faster, more accurate, and more comprehensive results compared to traditional audit methods, they are reshaping the audit landscape (Menzies, 2021).

The primary function of AIAS is to make sense of the vast amounts of data encountered in audit processes and derive meaningful insights. These software solutions utilize various algorithms and models to analyze, organize, and classify data. This enables the identification of risks, errors, and irregularities that auditors might previously have overlooked (Goh & Woo, 2023). AIAS can analyze not only financial data but also text-based data (e.g., contracts, emails) through its natural language processing (NLP) capabilities, extracting valuable information and identifying risks. Furthermore, it can detect inefficiencies or inconsistencies in business processes through process mining and facilitate proactive measures by predicting future risks using predictive analytics.

Another significant feature of AIAS is its process automation capability. By automating repetitive and routine tasks, it empowers auditors to focus on more strategic and complex endeavors (Susskind & Susskind, 2017). For instance, tasks

such as data entry, account reconciliation, and document verification can be automated by AIAS. This accelerates the audit process, improves accuracy, and minimizes human error.

AIAS also plays a crucial role in risk assessment processes. Analyses based on historical data, industry trends, and macroeconomic indicators enable more accurate identification of potential risks and the implementation of proactive measures (ICAEW, 2019). This not only enhances the effectiveness of the audit process but also strengthens the risk management strategies of businesses.

4. LEADING ARTIFICIAL INTELLIGENCE-BASED AUDIT SOFTWARE IN THE GLOBAL AND LOCAL MARKET

The transformative effect of artificial intelligence in the field of auditing has led to the emergence of various software in both the global and local markets. In this section, we will examine the leading artificial intelligence-based audit software that is reshaping audit processes and is at the forefront of the industry. First, we will discuss software that is widely used worldwide and serves a wide range of services from financial auditing to operational auditing.

4.1. Leading Artificial Intelligence-Based Audit Software Worldwide

In this section, we will examine prominent software in the fields of financial auditing, operational auditing, and process automation. Each of these software aims to make audit processes more efficient, effective, and reliable by utilizing artificial intelligence and machine learning technologies.

- MindBridge Ai Auditor (Financial Audit)
- Caseware IDEA (Financial and Operational Audit)
- AuditBoard (Operational Audit)
- HighRadius (Financial Audit)
- UiPath (Operational Audit)

The features and capabilities offered by this software play a significant role in shaping the future of the auditing profession.

4.1.1. Mindbridge AI Auditor

MindBridge AI Auditor is a revolutionary artificial intelligence platform in the field of financial auditing. This platform is designed to accelerate audit processes, provide more comprehensive audits, and assess the accuracy and reliability of financial statements (MindBridge AI, 2024). MindBridge AI Auditor stands out with its features such as big data analysis, anomaly detection, risk assessment, and fraud detection.

a. **Big Data Analysis:** MindBridge AI Auditor can quickly and effectively analyze large volumes of financial data that would be impossible to analyze with traditional methods. This feature allows auditors to examine more data in less time and identify potential risks earlier (MindBridge AI, 2024).

b. **Anomaly Detection:** The platform can detect anomalies and irregularities in financial data using advanced algorithms. This helps auditors identify suspicious transactions and potential fraud (MindBridge AI, 2024).

c. **Risk Assessment:** MindBridge AI Auditor utilizes artificial intelligence and machine learning techniques to assess a business's financial risks. This enables auditors to identify risky areas and allocate audit resources more effectively (MindBridge AI, 2024).

d. **Fraud Detection:** The platform can detect potential fraud by analyzing financial data. This feature helps businesses prevent financial losses and protect their reputation (MindBridge AI, 2024).

4.1.2. Caseware IDEA

Caseware IDEA is robust software widely used in financial and operational audit processes, facilitating data analysis and audit procedures (Caseware, 2024). With its artificial intelligence capabilities, it can analyze large datasets to identify anomalies and potential issues, making audit processes more efficient and effective.

IDEA's key AI features include:

a. **Anomaly Detection:** IDEA can detect anomalies, outliers, and irregularities in financial and operational data using advanced algorithms. This helps auditors identify suspicious transactions, errors, and potential fraud.

b. Data Mining: The software utilizes data mining techniques to uncover hidden patterns, relationships, and trends in large datasets. This allows auditors to better understand business processes, assess risks, and identify improvement opportunities.

c. Predictive Analytics: IDEA employs predictive analytics methods to forecast future events and risks based on historical data and trends. This helps auditors adopt a proactive approach and address potential issues in advance.

d. Continuous Auditing: The software supports continuous audit processes, enabling businesses to monitor risks and controls in real-time. This helps auditors detect problems earlier and respond more quickly.

Caseware IDEA can be used in various audit tasks, such as verifying the accuracy of financial transactions, identifying inefficiencies in operational processes, managing risks, and detecting fraud. This software enables auditors to analyze more data in less time, obtain more accurate and reliable results, and streamline audit processes

4.1.3. Auditboard

AuditBoard is a comprehensive audit management platform that optimizes audit processes using artificial intelligence and machine learning technologies (AuditBoard, 2024). By addressing fundamental elements of auditing such as risk assessment, audit planning, resource allocation, and reporting, enabling audit teams to work more efficiently and effectively.

a. Risk Assessment: AuditBoard identifies and prioritizes the internal and external risks of businesses using AI-powered risk assessment models. These models analyze large amounts of data to detect potential risks and help audit teams focus their attention on the most critical areas.

b. Audit Planning: The platform automatically generates audit plans based on risk assessment results. These plans define audit objectives, scope, timing, and required resources. Artificial intelligence ensures that audit plans are continuously updated and adapted to changing risks.

c. Resource Allocation: AuditBoard utilizes artificial intelligence algorithms to optimize audit resources (personal, budget, time). These algorithms assign audit tasks to the most suitable auditors, balance workloads, and ensure the efficient utilization of resources.

d. Reporting: The platform generates comprehensive reports containing audit findings and conclusions. Artificial intelligence automates the creation of reports, saving audit teams time. Additionally, the customizable nature of the reports allows for the effective communication of audit results to different stakeholders.

AuditBoard is a comprehensive audit management platform that transforms audit processes using artificial intelligence and machine learning technologies. By addressing fundamental elements of auditing such as risk assessment, audit planning, resource allocation, and reporting, it enables audit teams to work more efficiently, effectively, and in a risk-focused manner.

4.1.4. Highradius

HighRadius is an artificial intelligence platform that focuses on automating financial processes. It aims to increase the efficiency of financial operations and reduce risks by offering AI-powered solutions in areas such as accounts receivable management, payment collection, and cash forecasting (HighRadius, 2024).

a. Accounts Receivable Management: HighRadius analyzes customer payment behaviors using artificial intelligence algorithms, optimizes collection processes, and predicts late payments, helping businesses improve their cash flow. This enables businesses to more effectively manage accounts receivable risks and expedite collection processes.

b. Payment Collection: The platform integrates different payment channels to facilitate customer payments. Artificial intelligence automates payment processes, reducing human errors and ensuring faster processing of payments. This increases customer satisfaction and improves the cash flow of businesses.

c. Cash Forecasting: HighRadius predicts the future cash flow of businesses using artificial intelligence and machine learning techniques. These forecasts empower businesses to make more informed financial decisions and optimize their cash flow management. Especially in uncertain economic conditions, accurate cash forecasts are critical for businesses to maintain their financial stability.

HighRadius, with its AI-powered solutions, optimizes financial processes, increasing businesses' efficiency, reducing risks, and improving their financial performance. This platform is a significant example that demonstrates the potential of artificial intelligence in the field of financial management.

4.1.5 UiPath

UiPath is a robust Robotic Process Automation (RPA) platform focused on optimizing operational audit processes (UiPath, 2024). By incorporating AI-powered solutions, UiPath enhances the efficiency of audit procedures by automating repetitive and time-consuming tasks. This allows audit teams to dedicate more time to strategic and analytical tasks. The platform offers key AI and RPA technologies used in operational process auditing (UiPath, 2024).

a. Robotic Process Automation: UiPath leverages RPA technologies to automate repetitive and manual tasks in operational audit processes. This automation enables auditors to redirect their focus from time-consuming tasks to more complex audit responsibilities. Through RPA, tasks such as data entry and document processing are executed with high speed and accuracy.

b. Process Mining: UiPath employs AI-powered process mining tools to perform an in-depth analysis of business operations. These analyses help identify inefficiencies, bottlenecks, and potential risks within processes. Process mining allows businesses to optimize their existing workflows and use audit resources more effectively.

c. Anomaly Detection: The platform utilizes advanced machine learning algorithms to detect anomalies and irregularities in operational processes. This feature enables auditors to swiftly identify high-risk transactions and potential non-compliance areas, focusing on these critical zones to conduct more effective audits.

d. Reporting and Monitoring: UiPath offers comprehensive solutions for real-time monitoring and reporting of audit findings. By accelerating reporting processes through AI and automation tools, UiPath enables audit teams to quickly assess findings and take appropriate action. Furthermore, the customizable nature of these reports facilitates effective communication tailored to different stakeholders.

UiPath revolutionizes operational audit processes by allowing auditors to analyze larger volumes of data in shorter periods, thus increasing audit efficiency. By integrating AI and RPA technologies, the platform alleviates auditors from routine tasks, enabling them to focus more on strategic decision-making processes. These capabilities position UiPath as a leading platform for AI-powered audit solutions in the realm of operational audits.

4.2. Leading Artificial Intelligence-Based Audit Software in Turkey

The transformative impact of artificial intelligence in the field of auditing has led to the development of various software in Turkey, as it has globally. In this section, we will examine the leading artificial intelligence-based audit software that is reshaping audit processes and is at the forefront of the industry in Turkey. This software, operating in different areas such as operational auditing, financial auditing, and compliance auditing, aims to make audit processes more efficient, effective, and reliable by utilizing artificial intelligence and machine learning technologies.

This software is designed in accordance with Turkish regulations and the needs of the business world. At the same time, by complying with international auditing standards, they aim to increase the quality of audit activities at both local and global levels.

- ProManage (Operational and Compliance Audit)
- FAS (Financial Audit Software) (Financial, Operational, and Compliance Audit)
- Logo Mind (Financial Audit)

4.2.1. Promanage

ProManage is a Turkey-based audit management software that streamlines audit processes and facilitates risk management through its artificial intelligence capabilities. The software analyzes business processes to identify inefficiencies and provides improvement recommendations (ProManage, 2024). It also reduces compliance risks by checking companies' compliance with legal regulations.

ProManage's AI-powered features encompass:

a. Risk Management: ProManage utilizes artificial intelligence algorithms to identify and prioritize internal and external risks of businesses. This allows audit teams to focus their limited resources on the most critical risks and develop more effective risk management strategies.

b. Process Analysis and Improvement: The software analyzes business processes to identify bottlenecks, repetitive tasks, and inefficiencies. Artificial intelligence provides process improvement suggestions based on these analyses, helping businesses increase their operational efficiency.

c. Compliance Control: ProManage automatically checks the compliance of companies' activities with legal regulations and internal controls. This enables audit teams to proactively manage compliance risks and detect potential compliance issues in advance.

ProManage offers a solution specifically designed for the audit environment in Turkey, ensuring compliance with local regulations and business practices. This makes the software more effective and useful for Turkish companies.

4.2.2. Fas (Financial Audit Software)

FAS (Financial Audit Software) is a cloud-based intelligent financial audit system application developed with the support of TÜBİTAK to facilitate and increase efficiency in independent audit processes in Turkey (FAS, 2024). Designed in accordance with international standards, FAS is used to verify the accuracy and completeness of financial statements. It is versatile software that can be used in operational and compliance audits as well as financial audits.

FAS offers a range of key features, including:

a. Financial Statement Analysis: FAS automatically analyzes financial statements to detect errors, inconsistencies, and irregularities. This feature helps accelerate the audit process and obtain more accurate results.

b. Audit Planning: The software assists in creating the audit plan, identifies risky areas, and suggests appropriate audit procedures. This ensures that the audit process is carried out in a more planned and systematic manner.

c. Risk Assessment: FAS assesses the internal control system of the business to identify potential risks and analyzes the impact of these risks on the audit. This allows audit teams to focus on risks and utilize audit resources more effectively.

d. Collection of Audit Evidence: The software facilitates the collection, organization, and storage of audit evidence, increasing the efficiency of the audit process.

e. Reporting: FAS accelerates the preparation of audit reports and generates reports that comply with standards. This feature improves the quality of audit reports and makes the audit process more transparent.

f. Artificial Intelligence and Machine Learning: FAS utilizes artificial intelligence and machine learning technologies to automate audit processes and increase efficiency. These technologies analyze large datasets to detect anomalies, assess risks, and optimize audit processes.

FAS is an essential tool for audit firms and companies in Turkey. It improves audit quality by automating, accelerating, and making audit processes more reliable. At the same time, it contributes to the digital transformation of the auditing profession by enabling audit teams to focus on more strategic and value-adding tasks.

4.2.3. Logo Mind

Logo Mind is an artificial intelligence platform developed by Logo Yazılım, aiming to enhance the efficiency of businesses through its solutions in accounting and finance. Logo Mind's suite of features, including invoice verification, collection tracking, risk analysis, and reporting, bolsters financial audit processes.

a. Invoice Verification: Logo Mind automatically processes invoices, identifying errors and inconsistencies. This feature accelerates manual invoice checking processes, reduces human errors, and helps businesses maintain more accurate financial records.

b. Collection Tracking: The platform tracks customer payments, identifying late payments and potential collection issues. This enables businesses to manage their receivables more effectively and improve cash flow.

c. Risk Analysis: Logo Mind assesses the financial risks of businesses by analyzing financial data. This allows businesses to better understand potential risks and develop proactive risk management strategies.

d. Reporting: The platform presents financial data in various reports, helping businesses understand their financial performance and improve decision-making processes. Customizable reports can be tailored to the needs of different users, ensuring more effective sharing of financial information.

Logo Mind utilizes artificial intelligence technologies to automate, accelerate, and enhance the reliability of financial audit processes. This allows businesses to manage their financial management processes more efficiently and effectively.

4.3. A Comparative Analysis of AI-Based Audit Software in Turkey and Abroad

AI-based audit software (AIAS) introduces significant technological innovations that are transforming audit processes on a global scale. Software solutions in Turkey and other countries exhibit differences in terms of functionality, technological infrastructure, and adoption rates. This section will compare AIAS used in Turkey with their international counterparts and assess the current stage of development.

4.3.1. Functional Comparison

The core functionalities of AIAS typically include data analytics, anomaly detection, process automation, and risk assessment. However, there are notable functional differences between software solutions used in Turkey and those in other countries.

Globally recognized software such as MindBridge AI Auditor and Caseware IDEA are equipped with advanced features, particularly in anomaly detection and risk assessment. These platforms perform rapid analysis of large datasets, focusing on fraud detection. For instance, MindBridge AI can analyze millions of financial transactions to identify potential risks at an early stage. Additionally, it employs natural language processing (NLP) technologies to extract valuable insights from text-based data such as contracts and emails. This software is widely used in major markets like the United States, Canada, and the United Kingdom, particularly in the financial services sector.

In contrast, AIAS developed in Turkey, such as ProManage and FAS (Financial Audit Software), are more focused on operational process auditing and compliance checks. ProManage offers AI-supported analyses geared towards process optimization, particularly in the manufacturing sector. FAS is a software widely used by independent audit firms in Turkey, providing reports compliant with international auditing standards. However, these solutions have yet to fully integrate advanced technologies like NLP and machine learning-based anomaly detection.

4.3.2. Technological Infrastructure and Development Process

Global AIAS solutions possess more comprehensive technological infrastructures, integrating advanced AI algorithms, machine learning, robotic process automation (RPA), and data mining. Software such as MindBridge AI, Caseware IDEA, and AuditBoard not only analyze financial data but also conduct extensive analyses of operational processes, enabling effective risk management through rapid analysis of large datasets.

In contrast, AIAS developed in Turkey operate on more limited technological infrastructures. FAS, for example, was developed for use in Turkey's independent audit sector, facilitating large-scale data analysis in audit processes. However, complex and advanced algorithms seen in global software have not been fully integrated into Turkish solutions. Logo Mind, primarily targeted at SMEs, offers more basic automation of financial processes but has a narrower scope of application compared to its global competitors.

4.3.3. Adoption Rates

The adoption rates of AIAS globally are particularly high in developed economies and among large corporate firms. MindBridge AI and Caseware IDEA are widely employed by major corporations in the U.S., Canada, and Europe, with a significant portion of Fortune 500 companies utilizing these platforms. These solutions have become standard in audit processes in sectors requiring extensive data analysis, such as finance, healthcare, and retail.

In Turkey, however, the adoption of AIAS has not reached the same global levels. Nevertheless, large-scale domestic firms and public institutions have started to adopt software like ProManage and FAS. ProManage is widely used in Turkey’s major manufacturing facilities for process optimization and compliance audits, while FAS is preferred by independent audit firms. Logo Mind is predominantly utilized by SMEs and has yet to achieve widespread sectoral adoption.

4.3.4. Developments And Challenges in Turkey

Turkey’s progress in the development and adoption of AIAS lags behind global markets. The primary reasons for this include high investment costs, challenges in software integration, and a lack of expertise. In particular, Turkey needs to increase investment and expertise in AI algorithm development and big data analytics.

However, support from institutions like TÜBİTAK, which provides incentives for domestic AI projects, is accelerating development in this field. Projects like FAS, offering solutions compliant with international auditing standards, are enhancing Turkey's competitiveness in the global market. Additionally, the growing investment by Turkish companies in digital transformation processes is further encouraging the adoption of AIAS and accelerating sectoral growth.

4.4. Comparative Analysis Table

Table 1 presents a comparative analysis of the key features of leading AIAS in Turkey and abroad:

Table 1. Comparative Analysis of Leading AI-Based Audit Software in Turkey and Globally

SOFTWARE NAME	COUNTRY OF ORIGIN	COUNTRIES USED	FOCUS AREAS	KEY FEATURES
MindBridge AI Auditor	Canada	USA, Canada, UK	Financial audit Anomaly detection, risk assessment Fraud detection	Big data analytics Natural language processing (NLP) Machine learning-based risk assessment
Caseware IDEA	Canada	Global	Financial and operational audit Anomaly detection Data mining, continuous auditing	Data analytics Process mining Predictive analytics
AuditBoard	USA	Global	Operational audit Risk assessment Audit planning, resource allocation	AI-supported risk assessment Automated audit planning Resource optimization
ProManage	Turkey	Turkey	Operational and compliance audit Risk management Process analysis and improvement	AI-supported risk management Process analysis Compliance control
FAS	Turkey	Turkey	Financial, operational, and compliance audit Financial statement analysis, audit planning Risk assessment	Automated audit processes AI and machine learning integration Reporting in accordance with international standards
Logo Mind	Turkey	Turkey	Financial audit Invoice verification, collection tracking Risk analysis	Financial process automation AI-supported risk analysis Reporting

This table illustrates the key features of leading AIAS in both Turkey and other countries. These solutions have the potential to transform audit processes by making them more efficient, effective, and reliable. However, the areas of focus and capabilities of each software differ. Turkish software solutions generally have a more limited scope compared to their global counterparts and have not yet fully integrated some advanced technologies. Nevertheless, the fact that local software is better aligned with Turkish regulations and business practices is considered a significant advantage.

5. CHALLENGES, SOLUTION PROPOSALS, AND ETHICAL DIMENSION

While artificial intelligence-based audit software (AIAS) has the potential to revolutionize audit processes, it also brings a series of challenges and ethical issues. This section will address the main challenges posed by the use of AIAS, solution proposals for these challenges, and the ethical dimensions of artificial intelligence in the field of auditing.

5.1. Data Privacy and Security: Protecting Sensitive Information

Artificial intelligence-based audit software (AIAS) requires access to large amounts of data to effectively conduct audit processes. This data may include highly sensitive information such as customer information, financial records, trade secrets, and sometimes even personal health data. This raises significant concerns about data privacy and security (Issa et al., 2016). With the use of AIAS, the risk of this data falling into the hands of malicious individuals, being subject to unauthorized access, or being accidentally disclosed, increases (Arel et al., 2023).

Data breaches not only lead to financial losses for businesses but can also cause reputational damage, loss of customer trust, and even legal penalties. Therefore, AIAS developers and users should adopt a robust and multi-layered security approach to ensure data privacy and security.

One of the cornerstones of this approach is data encryption. Encryption aims to prevent unauthorized access to data by converting it into an unreadable format. Using encryption, especially during the transmission and storage of sensitive data, significantly enhances data security.

Data anonymization is another important method for ensuring data privacy. This method involves removing personally identifiable information (PII) to protect the identities of individuals in the dataset. Anonymization is an essential tool for safeguarding data privacy, particularly in AI applications like big data analytics.

Preventing unauthorized access is crucial for data security. AIAS should utilize strong access controls, user authentication, and authorization mechanisms to ensure that data can only be accessed by authorized individuals. Additionally, regular scanning and updating of systems for vulnerabilities are necessary for data security.

Establishing rapid response mechanisms against data breaches is a vital part of the data security strategy. AIAS should employ real-time monitoring and alert systems to detect data breaches. In the event of a data breach, swift action should be taken to prevent further damage to the data.

Fostering user awareness and education about data privacy is also of great importance. Users should understand data privacy risks and possess the necessary knowledge and skills to use data securely. This plays a significant role in preventing data breaches.

These steps taken by AIAS to address concerns about data privacy and security not only ensure compliance with legal requirements but also protect the reputation of businesses and enhance customer trust. Responsible and ethical use of AIAS increases the effectiveness and reliability of audit processes, providing significant benefits to both auditors and businesses.

5.2. Algorithm Bias: Fair and Impartial Decisions

Artificial intelligence-based audit software (AIAS) offers the potential to make unbiased and fair decisions, independent of the biases that human auditors (human auditors) have. However, the algorithms used in the decision-making processes of this software can learn existing biases and errors in the datasets they are trained on. This can lead to unfair, discriminatory, and erroneous outcomes (Kleinberg et al., 2018). For example, a credit assessment algorithm may discriminate against a particular ethnic group or gender based on historical data, resulting in the unfair rejection of loan applications.

Algorithm bias is a significant issue that threatens the reliability and ethical use of AIAS. To mitigate this issue, AIAS needs to be continuously monitored and evaluated (Doshi-Velez and Kim, 2017). It is crucial for the decision-making processes of algorithms to be transparent, meaning that how they make decisions should be explainable and auditable. Transparency facilitates the assessment of whether algorithms operate fairly and impartially and helps identify potential biases.

To reduce algorithm bias, diversity and inclusivity principles should be considered during the development and testing of algorithms. The diversity and representativeness of training data ensure that algorithms treat different groups fairly and equally. Additionally, the performance of algorithms should be regularly monitored, and necessary corrections should be made when potential biases are detected.

The solution to the problem of algorithm bias is not solely a technical matter. It is also a complex issue that involves ethical values such as social justice and equality. Therefore, AIAS developers, users, and regulators should work together to address the problem of algorithm bias and act in accordance with ethical principles.

5.3. Adequate Regulation and Oversight: Reliable Artificial Intelligence

Artificial intelligence-based audit software (AIAS), while offering opportunities in the field of auditing, also brings some regulatory and supervisory challenges. One of the most important issues in this area is the lack of sufficient legal regulations and supervisory mechanisms regarding the development, implementation, and use of AIAS. This situation may lead to uncertainties in ensuring that the use of AIAS complies with existing audit standards and may pose potential legal risks for both auditors and businesses.

AIAS operates using complex algorithms and models. The transparency, accountability, and compliance of these algorithms with auditing standards are critical for the reliability and validity of audit processes. However, the existing gap in adequate regulation and oversight in these matters may raise concerns about the reliability of audit results and the effectiveness of audit processes due to the use of AIAS.

To address these concerns and ensure the reliable use of AIAS, comprehensive and up-to-date regulations need to be established (Mikalef and Gupta, 2021). These regulations should define the standards to be followed during the development, testing, implementation, and use of AIAS and ensure the establishment of independent organizations to oversee these standards. Additionally, it is important to determine ethical principles regarding the use of AIAS and supervise the implementation of these principles.

Regulations for the development and use of AIAS not only ensure legal compliance but also enhance the reliability and acceptability of AIAS. This paves the way for the wider and more effective use of AIAS in audit processes.

5.4. Ethical Issues: Responsibility And Accountability

Artificial intelligence-based audit software (AIAS) are powerful tools that facilitate and accelerate decision-making in audit processes. However, the decisions made by this software can sometimes lead to ethical issues. Especially when using AI models called “black boxes” where the decision-making processes are not fully understood, the reasons and consequences of AIAS decisions can become unclear. This situation can raise significant ethical concerns regarding responsibility and accountability (Floridi and Cowls, 2019). For example, in the case of an AIAS making a wrong decision, who should be held responsible for this error: the software developer, the user, or the software itself? Such questions lead to important discussions in the field of AI ethics.

To ensure the ethical use of AIAS and minimize such ethical issues, both developers and users need to act in accordance with AI ethics principles (Jobin et al., 2019). These principles include fundamental values such as transparency, accountability, fairness, reliability, and human oversight. Transparency requires that the decision-making processes of AIAS be understandable and explainable. Accountability refers to the existence of a mechanism that can hold AIAS responsible for the consequences of their decisions. Fairness aims to ensure that the decisions made by AIAS are fair and free from discrimination. Reliability requires that the decisions of AIAS be consistent and trustworthy. Human oversight means that the decisions of AIAS are reviewed and, if necessary, intervened by audit professionals (human auditors).

Adherence to ethical principles alone is not sufficient to ensure the ethical use of AIAS. It is also necessary to implement technical and procedural measures to enforce these principles. For example, explainable AI (XAI) methods can be used to explain the decision-making processes of AIAS. These methods aim to explain the reasons behind AIAS decisions in a way that is understandable to humans. Additionally, regular review and approval of AIAS decisions by audit professionals are important. This ensures the accuracy and reliability of AIAS decisions while reducing the risk of ethical issues.

5.5. The Human Factor: The Importance of Expertise

Although artificial intelligence-based audit software (AIAS) makes significant contributions in many areas such as data analysis, anomaly detection, and risk assessment in audit processes, it cannot completely replace audit professionals (human auditors). AIAS can quickly and accurately analyze large amounts of data, detect complex patterns, and identify potential risks. However, human expertise remains essential in some critical stages of the audit process.

The assessment of complex situations is an area where AIAS has not yet fully mastered. Some situations encountered in audit processes can be too complex to be resolved solely through data analysis. In such cases, the experience, professional judgment, and critical thinking skills of audit professionals (human auditors) come into play. Auditors can interpret the data provided by AIAS, assess the context of the situation, and make a more comprehensive and accurate assessment by considering all relevant factors.

While AIAS is successful in identifying potential risks, the final decisions are still the responsibility of audit professionals (human auditors). Processes such as risk assessment, addressing ethical issues, and preparing audit reports require the expertise and experience of audit professionals. AIAS can be used as auxiliary tools in these processes, but the final decisions must be made by audit professionals.

Another reason why AIAS cannot replace audit professionals is that the audit process is not just a technical process. Auditing also requires human skills such as communication, trust, and relationship management. Auditors gather information by communicating with business management, establish trust relationships, and effectively communicate audit findings. These human skills cannot be replicated by AIAS and are critical to the success of the audit process.

5.6. Training and Development: Continuous Learning

The rapid advancements in artificial intelligence (AI) technologies are profoundly impacting the auditing profession. Therefore, it is of paramount importance for audit professionals to engage in continuous learning and development activities to benefit from the opportunities offered by AIAS and overcome the challenges they present (Applegate et al., 2019).

AIAS operates using complex algorithms and models. Therefore, auditors need to have a fundamental understanding of AI and machine learning (ML) to effectively utilize this software. This understanding enables them to grasp how AIAS works, what data it analyzes, how it makes decisions, and its potential risks. Additionally, auditors' awareness of the capabilities and limitations of AIAS helps them use this software accurately and effectively.

Continuous training and development not only ensure the effective use of AIAS but also help the auditing profession adapt to future needs. As AI technologies rapidly evolve, audit processes will change in parallel with these developments. Therefore, auditors need to stay abreast of the latest developments in AIAS and adapt to these changes. This ensures that the auditing profession remains current and makes the most of the opportunities offered by AIAS.

Ethical and legal issues related to the use of AIAS are also an essential part of continuous training and development. Auditors should understand the ethical principles and legal regulations regarding the use of AIAS and act in accordance with these principles. This ensures the reliability and ethical conduct of audit processes while helping to prevent legal risks.

6. THE FUTURE OF HUMAN AND ARTIFICIAL INTELLIGENCE COLLABORATION: SYNERGY AND TRANSFORMATION IN AUDITING

The collaboration between artificial intelligence (AI) and humans is crucial for increasing efficiency and effectiveness in audit processes (Sutton et al., 2023). This collaboration brings together both the strategic thinking and analytical skills of audit professionals (human auditors) and the speed and data processing capacity of AI, enabling audits to be conducted more comprehensively and effectively (Applegate et al., 2019). In this section, the impact of human and artificial intelligence collaboration on audit processes, the new skills and roles required by this collaboration, and the future vision of this collaboration will be examined in detail.

6.1. Complementary Skills: A Synergistic Future in Auditing

Artificial intelligence (AI) and audit professionals (human auditors) possess distinct capabilities that complement each other and create value together in audit processes. This synergistic relationship enhances the effectiveness and efficiency of audit processes, providing significant benefits to both auditors and businesses. AI demonstrates superior capabilities in areas such as analyzing large datasets quickly and accurately, detecting complex patterns, and automating repetitive tasks (Susskind & Susskind, 2017). This allows audit professionals (human auditors) to focus their time on more valuable tasks and increase the efficiency of audit processes.

AIAS reduces the workload of audit professionals (human auditors), enabling them to perform data analysis at a level not previously possible. This not only accelerates audit processes but also allows for the identification of errors, irregularities, and risks that might have been overlooked before. For example, an AIAS can analyze millions of financial transactions to reveal anomalies or patterns that raise suspicions of fraud (Goh & Woo, 2023). This helps auditors conduct more effective and focused audits.

However, these capabilities of AI cannot replace the skills of audit professionals (human auditors) such as critical thinking, effective problem-solving, empathy, and assessing complex situations (DataProt, 2022). Human auditors play a crucial role in interpreting, analyzing, and contextualizing the data provided by AIAS. For instance, while an AIAS can analyze a business's financial data and identify potential risks, the final decision on how to assess these risks in the context of business operations and the overall economic environment, and what strategies to implement, rests with the audit professionals (MindBridge AI, 2024).

The qualities of human auditors, such as experience, intuition, and professional judgment, play a critical role in interpreting the data provided by AIAS and in decision-making processes. While AIAS presents objective, data-driven information, audit professionals can combine this information with their expertise and experience to make more comprehensive and accurate decisions. This ensures that audit processes are not just technical analyses but also holistic processes that incorporate the human factor.

6.2. Transforming the Roles of Auditors with AI

Artificial intelligence-based audit software (AIAS) is not only transforming audit processes but also the roles of auditors. While traditionally auditors focused largely on manual and repetitive tasks, this is changing with the rise of AIAS (Accounting Today, 2023). AIAS automates routine tasks such as data entry, account reconciliation, and document verification, allowing auditors to redirect their time and energy towards more strategic and value-adding tasks.

This transformative effect of AIAS also brings about a change in the skill sets of auditors. Now, auditors need to acquire new skills such as data analytics, machine learning, and even basic programming to effectively utilize AIAS (The Financial Times, 2023). These new skills enable auditors to better understand and interpret the results produced by AIAS and make more informed decisions using these results. At the same time, it contributes to the professional development of auditors, preparing them for the future of the audit world.

This AIAS-driven transformation requires auditors to develop not only their technical skills but also their soft skills such as strategic thinking, problem-solving, communication, and relationship management. Auditors should analyze the data provided by AIAS to better understand the complex problems faced by businesses, develop effective solutions to these problems, and communicate these solutions effectively to business management and other stakeholders. This strengthens the role of auditors not only as data analysts but also as consultants and strategic partners.

6.3. Strategic Thinking: The Indispensable Role and Ethical Compass of Humans

Despite the advantages offered by artificial intelligence-based audit software (AIAS) in increasing efficiency and automating routine tasks in audit processes, the roles of audit professionals (human auditors) in areas such as strategic thinking, critical evaluation, and ethical judgment remain indispensable (The Wall Street Journal, 2021).

AIAS can analyze large amounts of data quickly and accurately, detect complex patterns, and identify potential risks. However, these capabilities do not equate to possessing the intuition, experience, and ethical values that human auditors have (Menzies, 2021). AIAS can analyze data and produce results, but the interpretation, evaluation, and contextualization of these results are within the expertise of audit professionals.

The role of audit professionals is particularly crucial in seeing the big picture and making strategic decisions. While AIAS may focus on a specific dataset, human auditors can make more comprehensive and strategic decisions by considering a broader context, such as the overall strategy of the business, developments in the industry, and economic conditions. This enables the development of more effective audit strategies that will help the business achieve its long-term goals.

Furthermore, the evaluation and resolution of ethical issues are also within the expertise of audit professionals. Since AIAS lacks ethical values, they may not be able to make the right decisions when faced with ethical dilemmas. Therefore, the evaluation and approval of AIAS decisions by audit professionals are essential to ensure an ethically responsible and sustainable audit process.

6.4. Training and Skill Development: Continuous Learning and Adaptation

The effective use of artificial intelligence-based audit software (AIAS) requires auditors to be proficient in areas such as AI technologies, data analytics, machine learning, and even basic programming (Applegate et al., 2019). Therefore, continuous training and skill development programs are vital for the future of the auditing profession.

Since AIAS operates using complex algorithms and models, auditors need to have a fundamental understanding of AI and machine learning (ML) to effectively utilize this software. This understanding enables them to grasp how AIAS works, what data it analyzes, how it makes decisions, and its potential risks (Cao et al., 2020). Furthermore, auditors' knowledge of data analytics and machine learning helps them accurately interpret the results produced by AIAS and integrate these results into audit processes.

Continuous learning and development not only ensure the effective use of AIAS but also contributes to the professional development of auditors. As AI technologies rapidly evolve, auditors need to keep up with these advancements and acquire new skills. Otherwise, the auditing profession may fall behind, and the potential of AIAS cannot be fully utilized.

Continuous training and development programs for audit professionals enable them to take advantage of the opportunities offered by AIAS and overcome its challenges. These programs not only equip auditors with practical skills for using AIAS but also raise awareness about the ethical and legal aspects of AI integration into audit processes.

6.5. Human-Machine Interaction and Decision-Making Process: A Synergistic Approach

Artificial intelligence-based audit software (AIAS) takes human-machine interaction in audit processes to a new dimension, offering a more effective and efficient decision-making process. AIAS provides valuable information and insights to audit professionals (human auditors) by analyzing large datasets quickly and accurately. However, final

decisions are still made based on the assessments, professional judgments, and ethical values of audit professionals (Cao et al., 2020).

AIAS reduces the workload of audit professionals (human auditors) and automates routine tasks, allowing them to focus on more complex and strategic tasks. This enables auditors to analyze the data provided by AIAS, better understand potential risks and opportunities, and make more informed decisions. For example, an AIAS can analyze a company's financial data and identify potential risks, but the final decision on how to assess these risks in the context of the company's overall strategy and objectives, and what measures to take, should be made by the audit professional.

Human-machine interaction plays a significant role not only in the decision-making process but also in the learning and development process of AIAS. Auditors evaluate the results produced by AIAS and provide feedback, enabling this software to continuously learn and improve its performance. This iterative process facilitates the ongoing adaptation of AIAS to audit processes and produces more accurate results.

Human-machine interaction offers a synergistic approach in audit processes. When the data analysis and automation capabilities of AIAS are combined with the expertise, experience, and judgment skills of audit professionals, more accurate, reliable, and effective audit results are achieved. This synergistic approach holds great potential for the future of the auditing profession.

6.6. New Professional Roles: AI Specialist Auditors and Audit Teams of The Future

The rapid advancement of artificial intelligence (AI) technologies in the field of auditing is leading to the emergence of new professional roles and the transformation of existing ones. One of the most significant examples of this transformation is the emergence of a new professional role that can be called "AI Specialist Auditor." These experts will possess in-depth knowledge and skills in both auditing and artificial intelligence, bringing these two fields together to advance audit processes further.

AI specialist auditors will play a crucial role in the development, implementation, and use of AIAS. These experts will ensure the integration of AIAS into audit processes, monitor the performance of AIAS, interpret the results, and ensure that AIAS complies with ethical and legal requirements. Moreover, AI specialist auditors will continuously develop new algorithms and models to maximize the capabilities of AIAS, making audit processes more efficient and effective.

With the rise of AIAS, the traditional auditor role will also undergo a transformation. Auditors will no longer focus on performing routine and repetitive tasks but will instead concentrate on more strategic and analytical tasks. This will require auditors to play a more active role in interpreting, evaluating, and making decisions based on the data produced by AIAS. This situation will enable auditors to further develop their skills in critical thinking, problem-solving, and communication (The Financial Times, 2023).

The audit teams of the future will have a multidisciplinary structure consisting of AI specialists, data scientists, ethics experts, and traditional auditors. These teams will work together to make the most of the opportunities presented by AIAS and overcome the challenges posed by AI. This collaboration will ensure that audit processes are more comprehensive, faster, more accurate, and more ethical.

6.7. Advantages Of Human and Artificial Intelligence Collaboration: A New Era in Auditing

The collaboration between humans and artificial intelligence (AI) offers multifaceted advantages that enhance efficiency, effectiveness, and quality in audit processes (Arel et al., 2023). This collaboration combines the expertise and experience of audit professionals (human auditors) with the speed, accuracy, and analytical capabilities of AIAS, providing significant benefits at every stage of the audit process.

a. **Increased Speed and Efficiency:** AIAS automates routine and repetitive tasks, allowing audit professionals (human auditors) to focus their time on more valuable tasks. This significantly accelerates audit processes and increases efficiency. For example, an AIAS can analyze large amounts of financial data in seconds, enabling audit professionals to complete a task that would take weeks in minutes.

b. **Accuracy and Reliability:** AIAS enhances the accuracy and reliability of audit results by performing tasks without human errors. This is of paramount importance when dealing with large and complex datasets. Instead of manual operations prone to errors, human auditors can focus on reliable results produced by AIAS, leading to more effective audits.

c. **Effective Risk Management:** Thanks to its advanced analytical capabilities, AIAS can identify potential risks that human auditors might overlook. This allows businesses to identify risks at earlier stages and take proactive measures. Additionally, AIAS enables continuous monitoring and assessment of risks, helping businesses manage their risk management strategies more effectively.

d. In-depth Analyses: AIAS can provide in-depth insights by analyzing large datasets that audit professionals cannot achieve. These insights can help businesses better understand their operations, increase efficiency, and gain a competitive advantage. For example, an AIAS can analyze a business's sales data to provide valuable information about customer behavior, sales trends, and product performance.

e. Strategic Focus: By automating routine tasks, AIAS allows auditors to focus on more strategic and value-adding tasks. This enables auditors to provide more strategic recommendations for the future of businesses and offer consultancy services. This enhances the value of the auditing profession and allows auditors to become more strategic partners for businesses.

6.8. A Human-Centric Approach: AI and Auditing with Ethics and Responsibility

Artificial intelligence-based audit software (AIAS) plays a significant role in audit processes, but this role should be in collaboration with, rather than replacing, audit professionals (human auditors). In this collaboration, a human-centric approach should be adopted, prioritizing ethical values and responsibility (Jobin et al., 2019).

AIAS possesses essential capabilities such as analyzing large amounts of data quickly and accurately, detecting complex patterns, and automating routine tasks. However, despite these capabilities, AIAS does not yet possess the critical thinking, professional judgment, and ethical evaluation skills that human auditors have (Menzies, 2021). Therefore, the use of AIAS in audit processes should be under the supervision and control of audit professionals.

A human-centric approach requires AIAS to be used merely as a tool in audit processes, with final decisions being made by audit professionals (human auditors). This approach ensures the compliance of audit processes with ethical values and accountability. Additionally, it is important that the use of AIAS contributes to the professional development of audit professionals and allows them to focus on more strategic tasks.

Considering ethical values during the development and use of AIAS ensures that artificial intelligence is used for the benefit of society. This includes ensuring that AIAS operates fairly, impartially, and transparently while respecting human rights. Moreover, it is crucial to assess potential risks and negative impacts associated with the use of AIAS in advance and take precautions against these risks.

6.9. Preparing for the Future: Competitive Advantage in Auditing Through Continuous Development and Adaptation

The rapid advancements in artificial intelligence (AI) technologies are fundamentally transforming the auditing profession. This transformation necessitates a continuous learning and adaptation process for audit professionals (Applegate et al., 2019). To leverage the opportunities offered by AIAS and overcome the challenges posed by these technologies, auditors need to continuously develop themselves and acquire new skills.

Audit professionals should understand the fundamental concepts in AI and machine learning (ML), learn how these technologies are integrated into audit processes, and grasp the capabilities and limitations of AIAS (Cao et al., 2020). Furthermore, enhancing their skills in data analytics, data visualization, and programming would help them effectively analyze and interpret the data produced by AIAS.

Continuous learning and adaptation are not limited to developing technical skills. It is equally important to be knowledgeable about the ethical and legal implications of AI. Auditors should understand the ethical issues and legal regulations that may arise in the use of AIAS and be able to make informed decisions on these matters (Jobin et al., 2019).

Advancements in AI technologies not only present new opportunities in the auditing profession but also bring new challenges. To overcome these challenges and gain a competitive advantage in the future of auditing, audit professionals need to invest in continuous learning and adaptation processes. This process is crucial not only for individual auditors but also for the future success of audit firms and the auditing profession as a whole.

6.10. Future Vision of Human and AI Collaboration: A New Synergy in Auditing

The future of human and artificial intelligence (AI) collaboration promises further automation, integration, and transformation in audit processes. This vision aims to enhance the capabilities of audit professionals (human auditors) and create more effective, efficient, and value-oriented audit processes by integrating AI more deeply into audit processes.

In the future, AIAS will not only automate routine tasks but also actively participate in audit processes by conducting complex analyses, predicting risks, and even making decisions in some cases. For example, AIAS can assess fraud risk, identify weaknesses in internal control systems, and even generate drafts of audit reports by analyzing large datasets.

These developments will also change the role of audit professionals (human auditors). Auditors will spend less time on routine tasks such as data collection and analysis and instead focus on more strategic tasks such as interpreting, evaluating,

and making decisions based on the results produced by AIAS. This will enable auditors to act more as consultants and strategic partners.

The development and use of AIAS will also provide a significant competitive advantage for audit firms. Audit firms that effectively utilize AIAS can increase customer satisfaction and expand their market share by offering faster, more accurate, and more comprehensive audit services.

However, some challenges need to be overcome for this future vision to be realized. In particular, there are concerns about the reliability, transparency, and ethical use of AIAS (Floridi & Cowls, 2019). To address these concerns, it is necessary to establish standards for the development and use of AIAS, create ethical principles, and strengthen oversight mechanisms.

7. CONCLUSION

This study examines the current state, potential, and future prospects of artificial intelligence-based audit software (AIAS), which is transforming audit processes by utilizing artificial intelligence (AI) and machine learning (ML) technologies. AIAS offers the potential to make audit processes more efficient, effective, and reliable by utilizing AI and ML capabilities in various areas such as analyzing and interpreting large amounts of data (big data analytics), identifying unusual situations or events (anomaly detection), automating routine tasks (process automation), and identifying and assessing potential risks (risk assessment).

This study elucidates the current state and future potential of AIAS in audit processes. AIAS reduces the workload of audit professionals (human auditors) by analyzing large datasets quickly and accurately, identifies risks at earlier stages by detecting complex patterns, and enables human resources to focus on more strategic tasks by automating routine tasks. These findings are consistent with the results of previous studies in the literature. For example, studies such as Cao et al. (2020) and Goh and Woo (2023) emphasize that AIAS has the potential to make audit processes more efficient, effective, and reliable. Particularly in the field of financial audit, the success of AIAS in analyzing large datasets to detect anomalies and potential fraud has been demonstrated with examples of software such as MindBridge AI Auditor and Caseware IDEA. In the field of operational audit, the capabilities of AIAS to analyze processes, identify inefficiencies, and provide improvement suggestions are exemplified by software like AuditBoard and UiPath. In the specific context of Turkey, domestic AIAS like ProManage, FAS, and Logo Mind have been found to play a significant role in optimizing audit processes and facilitating risk management.

This study provides a comprehensive examination of the current state, potential, and future vision of AIAS in audit processes. It concludes that AIAS, through its artificial intelligence and machine learning capabilities such as big data analytics, anomaly detection, process automation, and risk assessment, transforms audit processes, enhances the quality of audit processes, and can help businesses build a safer and more sustainable future.

This study has explored the diverse applications of AIAS across various audit types (e.g., financial, operational, compliance) and sectors (e.g., finance, healthcare, manufacturing, retail). These examples have revealed how AIAS transforms audit processes, what benefits it provides to businesses, and its potential risks. Particularly in the field of financial audit, the success of AIAS in analyzing large datasets to detect anomalies and potential fraud has been demonstrated with examples of software such as MindBridge AI Auditor and Caseware IDEA. In the field of operational audit, the capabilities of AIAS to analyze processes, identify inefficiencies, and provide improvement suggestions are exemplified by software like AuditBoard and UiPath. In the specific context of Turkey, domestic AIAS like ProManage, FAS, and Logo Mind have been found to play a significant role in optimizing audit processes and facilitating risk management.

However, the integration of AIAS into audit processes also brings some challenges and ethical issues. Issues such as data privacy and security, algorithm bias, ethical concerns, and regulatory compliance have been identified as important considerations in the development and use of AIAS. To address these challenges, this study proposes solutions such as data encryption, anonymization, access controls, and user training. Additionally, it has been emphasized that continuous monitoring and evaluation of AIAS are necessary to ensure algorithm transparency and accountability, enabling them to make fair and impartial decisions.

Looking ahead, AIAS is poised to integrate more data sources, enabling more comprehensive and in-depth analyses, improved detection of complex patterns, and more accurate predictions. This will make audit processes faster, more efficient, and less costly. Thanks to their continuous learning and adaptation capabilities, AIAS will be able to adapt more quickly to changing regulations and risks, increasing the effectiveness of audit processes. However, to fully benefit from the potential of these technologies, further research needs to be conducted, focusing on issues such as data privacy, algorithmic bias, and ethics.

This study aims to shed light on new research and applications in this field by addressing the current state and future potential of AIAS from a holistic perspective. The results of the study show that the integration of AIAS into audit processes presents both opportunities and challenges. To fully benefit from the potential of these technologies and minimize potential risks, it is necessary for auditors, businesses, and regulators to work collaboratively and invest in continuous learning and adaptation processes.

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