The Application of Artificial Intelligence in Audits: Evidence from Audit Firms in Malaysia

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ABSTRACT

This research sought to provide answers to what challenges audit firms face in the application of artificial intelligence (AI) in audit work and how AI transforms audit performance. The study adopted a qualitative analysis of reviewing the literature in relation to audit challenges and audit transformation with AI and by interviewing auditors from the Big 4 firms in Malaysia. The data was analysed manually and also using Nvivo 14.0. The study found that IT infrastructure and the operational software transition were considered as the main challenges in applying AI in audit firms in Malaysia. In addition the application of AI supported big data processing, changed the way of auditing and mitigated the audit risks and thus improved audit quality. The study provides further insights on the application of A I in audit firms in Malaysia. The findings may also increase the confidence of other Malaysian audit firms in investing in artificial intelligence-based auditing systems. The findings of the study add to the literature on AI by enabling researchers and practitioners to understand the application of AI in audit work and to find solutions to any obstacles. The originality of this research is asserted by the novelty of the study and limited source of information on AI and auditing in Malaysia setting.

Keywords: Artificial Intelligence; Audit Quality; Audit firm, Covid 19 Pandemic, data processing, audit risk

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INTRODUCTION

Today's auditors face environments that applied information technology comprehensively where storage of data has transformed from paper based to electronic methods. Large corporations tend to invest in highly sophisticated and complex computer systems that are fully integrated between departments. The integration of new technology needs to be well managed to ensure the quality of the services provided (Hamdan et al., 2024). The emergence of Artificial Intelligence (AI) has transformed the accounting systems and operations from manual systems into computerized ones (Abdullah & Almaqtari, 2024; Chukwudi et al., 2018). In line with this transformation, auditors too must change the way they gather evidence and perform audit procedures that cover data collection, the way data is stored, and the dissemination of data (Minkkinen et al., 2022). In addition, auditors must expand their knowledge and skills to successfully accept and manage electronic audit evidence.

Advanced application of technology called AI is inserting and modifying audits. The technologies that are available have a direct impact on audit procedures. In particular, the advent of computers has altered the nature and procedures of examination. It is generally accepted that using technology to undertake audits makes those tasks easier to complete and more productive. It must be noted that technology can completely alter what is done in the audit process, along with efficiency. When AI is used for contract analysis, it will eventually be possible to fully examine contract populations and extract their features (Deloitte 2016; PwC 2016).

Despite the many benefits that AI may provide to businesses, adoption of the technology is still in its infancy in Malaysia (Lee & Tajudeen, 2020). A follow up survey by the Malaysian Institute of Accountants (MIA) in 2019 indicated that high business cost as the main barrier to technology adoption, followed by lack of talents to use technology effectively and lack of understanding of the benefits of technology adoption. The adoption and usage rate of AI in 2019 was slightly more than 20%. In the next three years, the 2019 survey respondents expected to increase their adoption of AI tools to 36% (MIA, 2019).

This situation has raised considerable concern since AI is considered one of the drivers for the Industrial Revolution (IR) 4.0. The usage and use of AI in accounting has been the subject of numerous studies and very little evidence has focused on AI in auditing (Al-Sayyed et al. 2021). In addition, very limited number studies focused on the side of auditor to see the application of AI in auditing, and their opinion on the use of AI especially during the COVID-19 pandemic (Farcane et al., 2023). Lee and Tajuddin (2020) centered on a qualitative investigation into the adoption and effects of accounting software powered by AI in Malaysian enterprises. While Abdul Razak et al. (2020) looked at it from a legal perspective and came to the conclusion that there was a gap in the literature on the fiduciary obligation of the board of directors to rely on information provided by information generated by AI.

The research on application of AI in auditing was also a timely need especially during the Covid 19 pandemic where most activities are done electronically as there was a need to reduce face to face meetings. The conclusions gained may increase Malaysian audit companies' confidence to invest in AI-based auditing technologies. They would not fall behind other nations if they did this (Sian, 2024). Therefore, the current study sought to provide answers to the following research questions: What are the challenges faced by the audit firms (focusing on the Big 4) in Malaysia when using AI in audits? And how does AI transform the way an audit is performed?

The rest of this paper is structured as follows: The literature on adopting AI is reviewed in Section 2while Section 3 describes the technique used and Section 4 presents the findings. The paper is wrapped up in Section 5 which posits the conclusions and recommendations.

LITERATURE REVIEW

Definition and History of AI

AI can be defined as a mixed set of technology that changes and supplements the audit; AI technology availability has a direct impact on audit methods. As computers became more widespread, examination methods and their breadth has also been altered. The introduction of analytics will alter

the time scope of the audit, its efficiency, as well as the cost and benefit of the work. Automated tasks will start to resemble human behaviour as AI develops.

AI can be traced back to the 17th century, first introduced by Thomas Hobbes. He made the argument that symbols (such as numbers, graphs, calculations, and statistics) might be used as equivalent substitutes for longer expressions to solve issues and that the behaviour of a human being might be comprehended in mechanical terms (Issa et al., 2016). The goal was to make it possible for machines to solve issues and advance themselves by using language (in terms of abstraction and notions). Later, scientists employed many strategies to developAI. Unfortunately, the "AI Winters" followed the initial excitement with AI research since it could not produce reliable results because of technological constraints.

Recent advancements in infrastructure speed, availability, and scale, as well as the creation of cloud computing and the advent of new data storage and processing technology like ApacheTM Hadoop, have all contributed to the rebirth of AI. Deep learning, a recent development in AI that focuses on computational models (deep neural networks) for information representation, may automatically extract features from unstructured or semi- structured data, including photos, speech, text, video, and other types of data (Issa et al., 2016).

In addition Imoniana et al. (2023) demonstrated how auditing has been influenced by technological advancements, including Computer Assisted Audit Techniques (CAAT), the capacity building of IT auditors, the integration of AI and Deep Learning in auditing, and the emerging technological effects of Continuous Auditing of Blockchain. They also highlighted that innovative technologies such as supervised AI for data extraction and exception analysis, as well as IoT, drone monitoring combined with satellite imagery, remote sensing, deep learning, and robotic process automation, were also shaping the auditing landscape.

Artificial Intelligence (AI) in Auditing

Technology is a two-edged sword. On the one hand, it might interfere with our daily routine and make our customs obsolete. On the other hand,

we can harness technology and use it to improve our work. AI technology is no exception. The advent of AI is expected to change the way auditors conduct audits. The increasing usage of intelligent software agents is rapidly replacing humans in conducting audit procedures. Auditors can even use drones in performing audits (Appelbaum and Nehmer 2016). AI is also termed as a "computer program that can take balanced decisions, observe its environment and take actions that maximizes its chances of realizing a goal" (Issa et al, 2016). Accordingly, it does not come as a surprise that some existing practices will no longer be applicable. The current technology is able to collect and analyze the whole databases that override the traditional sampling.

Issa et al. (2016) demonstrated that when clients used AI in their system, it is to the advantage of the auditors to be more involved in the companies' system. However, such involvement can compromise their independence. Manual preparation and review of specific documents may become obsolete with AI technology. According to Issa et al. (2016) these procedures will be replaced by automated analytics using AI methodologies such as text mining, which will be able to deliver results that are more precise and effective. With AI, new auditors also will have to be trained differently as they now need a new set of skills. For instance, they need to learn various AI methodologies instead of being trained on traditional skills such as sampling techniques. All these mean that the accounting curricula need to be re-engineered to be able to meet the requirements of the future auditors (Peterson, 2016). It also follows that such accounting firms need to recruit more data scientists in order to help train auditors to use AI technologies.

The high-profile legal suits against auditors such as Enron, Xerox, WorldCom, and Parmalat are proof that auditors need to be on their toes and provide high quality audits and assurance services. Moreover, the auditing industry is getting more competitive and requires enhanced client services and speedy delivery. By reallocating budgeted time, AI has streamlined the automation of repetitive processes and provided value for clients. Professionals now have more time to create more individualized and innovative business insights (Bizarro & Dorian, 2017).

The above issues in auditing call for new and better tools in order to increase efficiency and effectiveness in auditing tasks. Therefore, according to Lee & Tajudeen (2020), in order for organizations to remain relevant and competitive, they must integrate AI technology into their daily operations. This is where AI can play a part. The application of AI in the accounting domain results in large databases as every transaction is tracked in real time right from the point of sale, through shipment and inventory counts. With such large databases, traditional audit procedures become less effective and efficient, hence requiring new ways to conduct audits (Dai and Vasarhelyi, 2016; Fedyk et al., 2022). Perhaps, auditors can also use AI technologies such as visual recognition, textual analysis, natural language processing, and audio processing (Issa et al. 2016).

Lee and Tajuddin (2020) conducted a qualitative study to investigate the use and impact of AIbased accounting software among organizations in Malaysia. They found AI to be important to both big and small organizations. AI can accelerate productivity, improve efficiency, enhance customer service, support the flexible working style, increase process governance as well as save manpower. Omar et al. (2017) conducted research on the governance of publicly traded enterprises in Malaysia at the AI dissemination stage. They came to the conclusion that there were certain ethical and legal issues with AI. Employees' unfavorable attitudes about AI adoption were among the behavioral problems, while organizations' worries about data security were included in the legal concerns.

Al-Sayyed et al. (2021) compared the effects of expert systems and neural networks, two AI approaches, on audit evidence, and discovered that expert systems had an impact but neural networks did not. They came out with few findings such as audit offices operating in Jordan had developed a greater interest in AI technology due to its practical use in enhancing audit evidence collection, to improve the gathering of audit evidence, emphasize the necessity to employ complex programming languages, encrypt them in a programmes, and save them in the knowledge base, stress the value of incorporating neural networks into mathematical audit guide models that are represented in diagrams that resemble computer systems. They also recommended that Jordanian audit offices should have electronic processing units in the form of neurons that make information available to users for the collecting of audit evidence, place special emphasis on educating auditors to

stay up with technical developments in AI applications for gathering audit guides, representing knowledge, and managing the search for such evidence within databases, the significance of developing the process of gathering and reformulating audit evidence into computer-embraced software for its function in enhancing the effectiveness of the audit process, make greater use of neural networks, particularly when it comes to giving users clear and accurate recommendations about the audit guides, as well as solutions and the justifications for those solutions, pay more attention to providing auditors with numerous opportunities to learn and apply AI techniques due to the methods' significance in enhancing the gathering of audit evidence.

Benefits of AI in Auditing

Prior research has highlighted the benefits of AI in auditing (Fedyk et al., 2022; Chowdhury, 2021; MUnoko et al., 2020; Aitkazinov, 2023). Munoko et al. (2020) claimed that the advantages of using AI in auditing and advising tasks include time saving, quicker data processing, higher levels of accuracy, more in-depth insight into corporate operations, and improved client service. The Big 4 firms use AI in areas including audit planning risk evaluations, transaction testing, analytics, and audit work-paper preparation.

By utilising new technology, auditors can gather a wide variety of audit-related data in real- time, automate repetitive tasks involving few or straightforward decisions, and eventually reach thorough, precise assurance. As business processes become more digitalized throughout the entire organisation, auditors are better able to continuously monitor business operations and spot unusual activity in real time (Dai and Vasarhelyi, 2016). Modern AI systems may progressively recognise and extract pertinent accounting information from diverse sources, including sales, contracts, and bills, by scanning for keywords and patterns in complicated electronic documents (Agnew 2016). Fedyk et al. (2022) documented that AI enhanced audit quality, lowered fees, and may eventually replace human auditors, although the impact on the labor market may take several years to become evident.

Challenges in AI Adoption

Auditing requires a lot of value judgement and may never be fully automated. The automation of labour-intensive jobs is the main emphasis of AI capabilities in auditing (Rapoport 2016). These are systematic, routine tasks carried out during the audit. According to Issa et al. (2016), auditing did not lend itself well to automation as its activities are widely based on judgments, instead of well-defined and repetitive tasks. Human touch is required to deal with the enormous variance of cultural environments and international constraints. Furthermore, some obstacles have been cited regarding the use of AI in auditing, such as a lack of soft skills to utilise and manage AI, uncertainty about compliance with the International Standards on Auditing (ISAs), and a general lack of confidence in AI's potential in a constantly uncertain environment (Raphael, 2017).

However, Oldhouser (2016), highlighted that the labour intensiveness and range of decision structures in auditing profession made it suitable for partial automation. Kokina & Davenport (2017) also had the same view as they opined that many audit duties can be automated since they are structured, repeatable, and standardised. Because it has become difficult to incorporate the enormous volumes of structured and unstructured data to get insights on the financial and nonfinancial performance of companies, auditing is particularly well suited for applications of data analytics and artificial intelligence. The implications of AI are probably going to be most noticeable in audit jobs that were previously done manually but have already had some technological support (Agnew 2016).

The availability of substantial processing power and large data facilitated the usage of AI. Furthermore, a lot of AI software was developed over the years, both open source and proprietary versions. A typical human approach to analytics and decision-making is also frequently inapplicable in today's world. Humans cannot be used in this procedure since there is too much information to consider and not enough time.

RESEARCH METHODOLOGY

Research Design

The aims of this study were to address the challenges faced by audit firms in Malaysia when using AI in auditing, as well as to explore how AI transforms the auditing process. We employed a phenomenological approach as our method of inquiry to gain deeper insights into the use of AI in audit firms. A seminal work by Cilesiz (2011) described phenomenology is an ideal approach for studying human experiences with technology where phenomenological research is a systematic approach aimed at uncovering and describing the structures of lived experiences, ultimately seeking a deeper understanding of the nature and meaning of phenomena.

Following Ghanoum (2020), we developed a structured interview questions to align with the current research objectives. The questions primarily focused on the challenges auditors faced when integrating AI into auditing. Additionally, the questions also addressed whether the audit scope changed when AI was applied in auditing. Table 1 provides an example of interview questions employed in this study.

Table 1: Example Of Interview Questions

Category	Question No.	Interview Questions
Demographic Questions	1	Position of the interviewee
	2	Years of service
	3	Firm profile
	4	Client profile
AI in Auditing	1	Do you apply AI in auditing?
	2	Can you explain how AI works? Can you share the name of the AI software that your firm uses in auditing?
	3	Is it a different type of software or is it embedded into existing audit software? Was it developed or just bought off the shelf?
	4	Can you explain with examples the usage of AI in auditing?
	5	Can you explain with examples the benefit of AI in auditing? By how many percent does AI improve the efficiency and effectiveness of auditing?
	6	Do you use AI in every stage of auditing – Audit Planning & Risk Identification, Risk Assessment, Audit Execution, and Finalizing & Reporting?

Category	Question No.	Interview Questions
	7	Among all the four audit phases, which phase uses AI the most?
	8	Do you also use AI for test of controls and substantive testing? Between the two, which do you use AI the most?
	9	Between substantive testing of transactions, balances, and analytical procedures, in which do you use AI the most?
	10	For sales and collection cycle for STOT and STOB – give an example.
	11	Any impact of AI on risk assessment?
	12	Any impact on nature, extent, and timing of audit procedures?
	13	Any impact on materiality level?
	14	Any issue with auditing standards (ISA)?
	15	Does AI improve the process of expressing the audit opinion?
	16	Is AI suitable for every type of audit client – by industry, size, and company age?
	17	For audit procedures carried out by AI that were previously human-performed, are there any issues with auditing standard requirements?
	18	How did COVID-19 impact the use of AI in auditing? Did AI usage increase, decrease, or stay the same?
	19	What challenges have you faced in applying AI in auditing?
	20	What should auditors have to successfully use AI – e.g., IT staff, investments in infrastructure?
	21	What is your advice to small audit firms regarding AI usage, especially for clients with basic IT infrastructure?
	22	What should clients have or implement so that auditors can use AI effectively?
	23	What is your opinion on the future of auditing with AI? Can AI replace humans 100% in auditing?
	24	Other comments

Research Population and Sample

For this study, a non-probability sampling technique called purposeful sampling was applied. Judgment sampling, also known as purposeful sampling, is the deliberate selection of a participant based on the participant's personal characteristics (Etikan et al, 2016). It was appropriate for use in this study because the researchers' main objective was to learn about auditors' experiences with the use of AI in the audit process. Interviews with auditors from the Big 4 that had incorporated AI into their audit processes were

chosen as the approach for gathering data for this study. This was done to get their perspectives on the phenomena being studied, based on their experience in audits. An email was sent to formally inquire if the audit firm used AI in its practices. The interview proceeded with those audit firms that had incorporated AI into their audit work. "Incorporating AI" refers to companies that utilized AI in their audit practices such as Caseware.

Data Collection

Five auditors from various firms were interviewed, consisting of three males and two females. To support the credibility of the data for the study's validity, interview session analysis is provided in Table 2 below along with positions of the auditors at the firms, gender, means by which the interview was performed, and length of the interview. Due to the continuing COVID-19 epidemic and the ensuing social distance limitations, no in-person meetings were allowed at the interviewees' offices. Instead, all interview sessions were conducted online. The interviews were conducted via google meet, and the participants were engaged in a friendly conversation. For simplicity of analysis and reliability, the interviews were done in English, and the sessions were taped and afterwards converted to a word document.

Table 2: Interview Session Analysis

Participant	Position at Firm	Years of Experience	Gender	Interview Means	Duration of Interview	Date	Day
Auditor 1	Audit Manager	4 yrs	Male	Google Meet	40 minutes	29 January 2021	Friday
Auditor 2	Auditor	2 yrs	Male	Google Meet	30 minutes	18 March 2021	Thursday
Auditor 3	Manager	6 yrs	Male	Google Meet	62 minutes	20 April 2021	Tuesday
Auditor 4	Senior Associate	2 yrs	Female	Structured interview (written response)	Returned after 4 days given	21 May 2021	Friday
Auditor 5	Senior Manager	10 yrs	Female	Structured interview (written response)	Returned after 3 days given	25 June 2021	Friday

The information from the interview were analyse manually and also by using Nvivo 14.0. The information was initially recorded verbatim. The research team read the detailed narratives created during data collection numerous times to comprehend the interviews' content. Later, to learn

how respondents applied AI the interview transcripts were independently summarized in various nodes and codes (Bazeley and Jackson, 2013). Data sorting and retrieval were made easier using the categories that resulted from coding. An independent researcher (with expertise in the subject) was hired to provide input on the codes, nodes, and categories indicated in order to determine the reliability of coding through content analysis and the coder dependability (Denzin et al., 2006). Statements were derived from the transcripts and then grouped to create themes for this study. Apart from the manual analysis, the data was also run using the Nvivo. Information on the analysis of the interview session is provided in Table 2.

Our research focused on the application of AI in auditing. To thoroughly analyse and comprehend various types of data gathered from auditors, we used Nvivo, a prominent software for qualitative data analysis. The initial stage involved carefully categorizing the textual data obtained from respondents about the application of AI in auditing. This process included the identification and categorization of text segments using special codes that reflected different ideas regarding the challenges the auditor faced by adoption of AI and how AI transformed the audit work.

After completing the initial coding, the study employed matrix coding, to systematically analyse the connections among these codes. Matrix coding enabled the visualization and quantification of the frequency of co-occurrence of different codes within the set of data.

FINDINGS

Challenges Using AI in Auditing

There are few challenges faced by auditors due to the rapid advance of today's technology coupled with the Covid-19 Pandemic. The respondents were of the opinion that training, reluctance to change, familiarity with the current system, and level of competencies were the main challenges in the implementation of the AI in auditing. The respondent mentioned that:

> *For the second year of auditing, a process is a bit easier where the auditors are no longer required to tag/map the ledger like in*

the first year. However, the auditor may have the similar cycle / problem like in the first year (tag/map) when the client changes its accounting software (Auditor 1 and 3).

Another factor that contributed to the challenges is the Information Technology (IT) facility where some respondents mentioned that:

Some laptops have insufficient space to run AI tools especially when it involves big data. (Auditor 2)

Usage of AI in auditing

The respondents were asked on the usage of Ai in auditing. The respondents were of the opinion that with current situation, the application of AI was very much needed especially when dealing with a large data set. The respondent explained:

Application of AI in auditing is more towards support in processing big data. Let say, a client has a large revenue stream. In the revenue ledger, various revenue stream available such as cash sales and credit sales. AI helps to corroborate between accounts or ledgers. For example, from sales to trade receivables to cash (Auditor 1).

Four respondents explained that their audit firms were using the same software in auditing called CaseWare, a solution that provides a streamlined approach for managing and conducting audits without affecting quality, with content provided by major accounting bodies. One of the respondents explained:

We are using CaseWare, sometimes we called it Global Focus for the purpose of connecting the audit that provide systematic audit sampling and working paper, furthermore with the current situation of Covid -19 that require us to work from home, we also need to apply another software, Inflo Digital Audit that connect to CaseWare. This software is really helpful where the clients will upload all the information and evidences in this platform, which is an all-in-one platform that ultimately connect to CaseWare for auditing (Auditor 3).

Furthermore, on the choice of software to be used it depended on the requirement of the audit firm and as stated by one of the auditors:

> *It is done part by part to get to know the software first. This is why, a certain feature such preparation of final statement feature is not acquired at this moment. The decision as to which features to be acquired is based on cost benefit analysis (Auditor 1)*

Specifically, the use of AI will be able to ensure the completeness of the activities as highlighted by auditor:

> *The usage of AI tools to perform Journal Entry testing to ensure completeness and detect suspicious activities. Optical Character Recognition tool is used to extract information/data from policies, invoices, forms (Auditor 4).*

AI and The Transformation of Audit

Auditors were asked on AI and the transformation of audit especially in the era of Industrial Revolution 4.0. The following respond described on how AI playedits role:

> *Audit quality and auditing process become more efficient. AI help auditor in processing the big data. But before the AI is able to process the data, we need to massage data extensively, especially for the first year. We need to tag and map the item in the ledger and match with appropriate reporting format. Then, after the tagging, AI will be able to provide appropriate analysis of the revenue stream and this can be used as useful audit evidence. Without proper tag/map appropriately, the software is unable to provide any useful evidence for the auditor. (Auditor 1).*

Apart from that, AI can also help in substantive testing. As highlighted by one of the auditors:

> *Let say, test of detail of revenue as mentioned earlier. In terms of audit opinion, AI is unable to help much because audit opinion involves professional judgement, partner risk and the risk level where the partners are willing to accept*. (Auditor 5)

In addition, they also provided information on how AI transformed the audit, specifically looking from the aspect of sampling. They highlighted that:

> *With certain audit software with AI in the market, sampling process is no longer applicable when the software is able to process the whole population. However, this is only true for certain audit assertions such as completeness. For other audit assertions such as rights and obligations, sampling is still relevant. For this type of audit assertion, AI help the auditor in choosing the appropriate sample to test, so that the sample selected is most representative of population. (Auditor 2)*

> *The rights and obligations can be assured where auditor need to vouch the selected document physically and match with appropriate transaction. In this case, manual testing by auditors is still required and therefore, sampling is still needed. Sampling and manual testing is also applicable in order to ensure existence of transaction. (Auditor 4)*

Another new finding which emerged during the conduct of the interview was that the respondents believed that AI improved audit quality, as explained by one of the auditors:

> *In addition, the audit client also has different types of business activities such construction, plantation, etc. AI analyse the revenue stream – how much the cash sales, credit sales, revenue from trading business, construction business etc and the figure obtained can be used by the auditors to confirm with the management and the auditors will be more comfortable with the figures. (Auditor 5)*

> *Auditor is also able understand the business of the client. Evidence provided by the AI, also helps the auditor to ask more relevant questions. Consequently, AI will help to improve audit quality (Auditor 2).*

Advantages of AI in Auditing

The findings of the interview led us to develop a map of the contribution of AI as shown in figure The contribution of AI in auditing can be seen from the aspect of efficiency that saved time and cost, effectiveness in auditing, improved audit quality, improved audit risk management and was able to analyse big data. One of the respondent highlighted with reference to big data analysis:

> *AI helps us to analyse the big data but not complex data. Examples of complex data are assessment of goodwill on consolidation, impairment of asset etc. This scenario involves many transactions such as acquisition, merger etc. Therefore, at this moment, AI is unable to help us in this and we need perform manually and use professional judgement (Auditor 2).*

> *AI also allows auditors to process big data more accurately with lesser time. It can also make good presentation of data (in graphs, charts etc.) (Auditor 4).*

Specifically, all the respondents agreed that AI can reduce audit risk since the auditing using CaseWare allowed for non-sampling, where all data can be tested within a short duration, which means it is more representative and thus increased audit quality. This finding is in line with Ghanoum (2020) where the all stakeholders gained from the increased efficacy of the process as a result of the interaction between AI and the auditing process and the competence with which the assignment was handled.

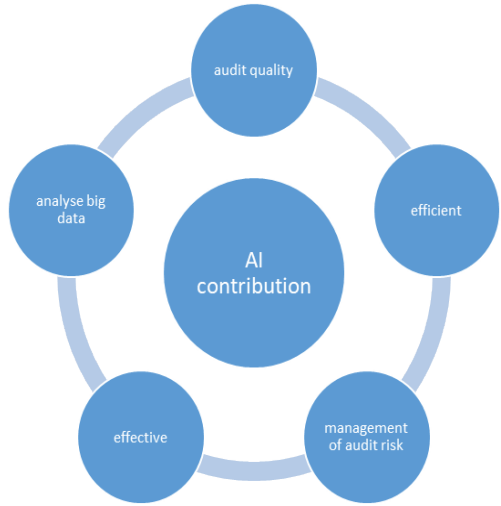

Figure 1: The Map of AI Contribution in Auditing

FUTURE DIRECTION FOR AUDITOR

Respondents were asked on the future direction of auditors when AI features were embedded in auditing. They were of the opinion that IA will never replace the function of auditors. They reported that:

> *Because the accounting standards itself is principle based, not rules based, it required professional judgement and experience of human (Auditor 1).*

> *AI at this moment is not meant or able to replace the auditor 100%. Because decision making in audit still requires professional judgement, for example, sample selections and audit opinion. Auditing also is about compliance with certain rules and regulation and involves risk management where it requires human intervention and judgement. So, in my opinion, at this moment, AI is unable to cater that function (Auditor 2).*

> *I think the used of enhance technology in audit definitely will change the audit landscape from manual auditing to tools or machine audit and will affects the demand for an auditor in*

future. While the tools can speed up the audit and improve quality, there are certain things that still required human intervention such as in decision making process, hence it will not replace human auditor totally. Some repetitive functions and redundant task can be done by the machine, but the skills to be an auditor is still necessary (Auditor 5).

Auditors can spend time in more important tasks rather than spending hours in processing data. Better quality of audit in terms of reporting (Auditor 4).

All auditors agreed that todays and the future auditors need to be equipped with AI knowledge:

No compromise, they need to have AI knowledge and be able to fasilitate the audit process.

It can be concluded that human touch is still in need, where professional judgement requires for humans to take part in the auditing decision.

Diagram 1 illustrates the result of the matrix coding query, displaying the frequency of code intersections in the study.

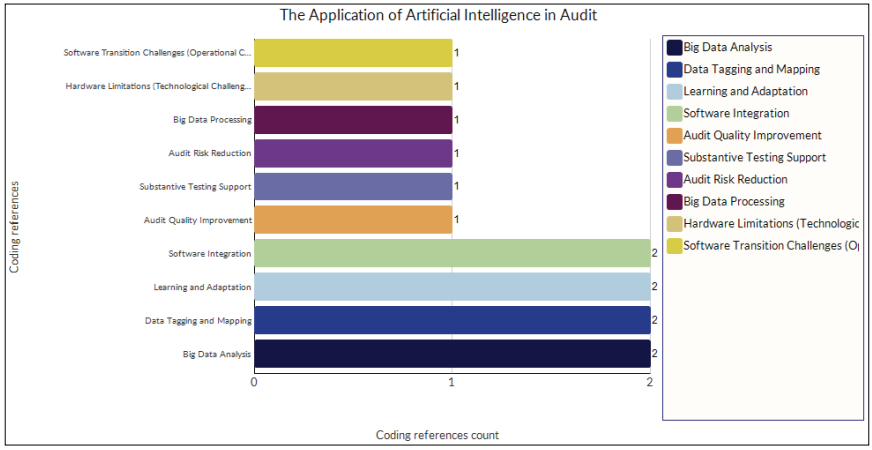

Diagram 1: Matrix of Code Intersections: The Application of AI in Auditing Analysis

Expanding upon the findings of the matrix coding presented in Diagram 1, the subsequent Table, labeled as Table 3, provides an in-depth analysis of the results obtained.

Table 3: Detailed Analysis of AI Application in Auditing

Code	Frequencies	Explanations
Software Integration	2	Describesthe integration of AI software, like CaseWare, to streamline auditing processes.
Learning and Adaptation	2	Focuses on the ongoing learning and adaptation required by auditors to effectively use AI tools.
Data Tagging and Mapping	2	Involves AI's use in organizing data for better accessibility and analysis.
Big Data Analysis	2	Refers to AI's capability to handle large datasets efficiently, enhancing data analysis processes.
Software Transition Challenges	1	Highlights operational challenges when switching or upgrading AI software within audit practices.
Hardware Limitations	1	Points to the technological challenges, such as insufficient computer storage to run AI tools.
Big Data Processing	1	Related to the processing capabilities of AI to manage and analyze extensive data sets.
Audit Risk Reduction	1	Refers to how AI helps reduce potential risks in auditing by providing more comprehensive data analysis.
Substantive Testing Support	1	Pertains to AI's assistance in detailed testing of transactions to ensure audit completeness.
Audit Quality Improvement	1	1Indicates AI's role in enhancing the reliability and quality of audit outcomes.

Following the detailed analysis shown in Table 3 , the study enhanced the analysis by classifying the different codes into a hierarchical structure illustrated in Diagram 2. The illustration is structured around three main themes that cover the fundamental aspects of the study: The use of AI in Auditing, Challenges in AI Integration, and contribution of AI in Auditing. Each theme represents specific codes that collectively demonstrate deeper insights into the application of AI technologies in the auditing process.

Diagram 2: Hierarchical Themes Derived from the Application of Artificial Intelligence in Auditing

Expanding on the hierarchical chart of AI application themes shown in Diagram 2, the study moved on to a comprehensive table presentation. The following Table, referred to as Table 4, detailed thematic analysis from hierarchical chart, comprehensively analysed the results presented in the hierarchical chart, providing a detailed examination of the application of AI in auditing as investigated in our study. This table provided a complete breakdown of each theme mentioned in Diagram 2. It included the specific codes associated with each theme, presented a detailed discussion of the meaning of these themes and provided actual responses from the respondents.

Table 4: Detailed Thematic Analysis From Hierarchical Chart

Theme	Sub-theme	Explanation	Emerging codes	Actual response
The use of AI in Auditing	Technological integration & adaptation in auditing	This sub-theme encompassed how AI tools are incorporated into the auditing workflow and how auditors must adapt to leverage these technologies effectively. Both codes highlighted the dual need for technological upgradation and skill enhancement to harness the full potential of AI in auditing.	Software Integration	*"We are using CaseWare, sometimes we called it Global Focus for the purpose of connecting the audit that provide systematic audit sampling and working paper, furthermore with the current situation of Covid -19 that require us to work from home, we also need to apply another software, Inflo Digital Audit that connect to CaseWare. This software is really helpful where the clients will upload all the information and evidences in this platform, which is an all-in-one platform that ultimately connect to CaseWare for auditing."* (Auditor 3)
			Learning and Adaptation	*"It is done part by part to get to know the software first. This is why, a certain feature such preparation of final statement feature is not acquired at this moment. The decision as to which features to be acquired is based on cost benefit analysis".* (Auditor 1)
	AI-enhanced audit efficiency	This sub-theme focused on the operational efficiencies brought by AI, specifically through better data management and analytical capabilities. Both codes demonstrated how AI can enhance the audit process by making data handling more efficient and analysis more robust.	Data Tagging and Mapping	*"The usage of AI tools to perform Journal Entry testing to ensure completeness and detect suspicious activities. Optical Character Recognition tool is used to extract information/data from policies, invoices,*
				forms". (Auditor 4)
			Big Data Analysis	*AI helps us to analyse the big data but not complex data. Examples of complex data are assessment of goodwill on consolidation, impairment of asset etc. This scenario involves many transactions such as acquisition, merger etc. Therefore, at this moment, AI is unable to help us in this and we need perform manually and use professional judgement* (Auditor 2) *the audit client also has different types of business activities such construction, plantation, etc. AI analyse the revenue stream – how much the cash sales, credit sales, revenue from trading business, construction business etc and the figure obtained can be used by the auditors to confirm with the management and the auditors will be more comfortable with the figures.* (Auditor 5)

	Enhancing audit standard	This sub-theme captured how AI contributed to higher audit standards through better testing and overall enhancements in audit quality. Both codes related to the use of AI for in-depth testing of transactions and balances, improving the thoroughness and reliability of audits. In addition, it signified broader enhancements in audit quality facilitated by AI, including improvements in accuracy, reliability, and the reduction of errors.	Substantive Testing Support	*Let say, test of detail of revenue as mentioned earlier. In terms of audit opinion, AI is unable to help much because audit opinion involves professional judgement, partner risk and the risk level where the partners are willing to accept*. (Auditor 5)
			Audit Quality Improvement	*Audit quality and auditing process become more efficient. AI help auditor in processing the big data. But before the AI is able to process the data, we need to massage data extensively, especially for the first year. We need to tag and map the item in the ledger and match with appropriate reporting format. Then, after the tagging, AI will be able to provide appropriate analysis of the revenue stream and this can be used as useful audit evidence. Without proper tag/map appropriately, the software is unable to provide any useful evidence for the auditor.* (Auditor 1)
Challenges in AI Integration	Technological and Operational Challenges in AI Integration	This sub-theme compiled challenges related to technological issues and the operational difficulties of integrating AI into existing systems. Both codes under this sub-theme signified crucial barriers that needed addressing to optimize the adoption and effectiveness of AI in auditing practices.	Software Transition Challenges (Operational Challenges)	For the second year of auditing, a process is a bit easier where the auditors are no longer required to tag/map the ledger like in the first year. However, the auditor may have the similar cycle / problem like in the first year (tag/map) when the client changes its *accounting software* (Auditor 1 and 3)
			Hardware Limitations (Technological Challenges)	*Some laptops have insufficient space to run AI tools especially when it involves big data*. (Auditor 2)

Contribution brought by AI in Auditing	Enhancement brought by AI in Auditing	This sub-theme encapsulated the key areas where AI contributed significantly to the auditing field, specifically focusing on the processes of data handling and risk management.	Big Data Processing	*Application of AI in auditing is more towards support in processing big data. Let say, a client has a large revenue stream. In the revenue ledger, various revenue stream available such as cash sales and credit sales. AI helps to corroborate between accounts or ledgers. For example, from sales to trade receivables to cash* (Auditor 1) AI also allows auditors to process big data more accurately with lesser time. It can also make good presentation of data (in graphs, *charts etc.)* (auditor 4).
			Audit Risk Reduction	*For this type of audit assertion, AI help the auditor in choosing the appropriate sample to test, so that the sample selected is most representative of population.* (Auditor 2)

DISCUSSION

The findings highlighted the advantage of big data processing and reduced audit risk while applying AI in auditing. This enhancement brought by AI in auditing are in line with the other prior research (Xing et al., 2020; Fedyk et al., 2022; Munoko et al., 2022) The auditors were of the view that they will be able to use their human judgement to examine a wider and deeper range of data and documents. The use of AI only changes the way of auditing as the scope still remained the same. This was more obvious during Covid 19 Pandemic. In addition, as technology becomes more sophisticated, particularly in the era of the Industrial Revolution, the use of AI becomes increasingly relevant.

The Usage of AI in Auditing

The auditing profession has experienced substantial transformations as a result of the impact of AI. The analysis derived from NVivo provided an in-depth understanding of the integration and adaptation of AI technology in the auditing practice, consequently enhancing operational efficiency and elevating auditing standards. This section will discuss the different impacts of AI based on three sub-themes derived from the NVivo analysis, which provided evidence for the extensive adoption of AI in the auditing profession.

Technological Integration and Adaptation in Auditing.

This sub-theme focused on the initial integration of AI technology in the auditing process, highlighting the importance of integrating advancements in technology and enhancing auditor skills. The auditors provided detailed feedback on the proposed integration of AI platforms, including CaseWare and Inflo Digital Audit. The platform had a significant impact on adapting auditing practices to tackle modern challenges, such as the remote working environment resulting from the COVID-19 pandemic.

AI-Enhanced Audit Efficiency

This sub-theme emphasised the evaluation of effective operations in the auditing field by using AI. Auditor comments highlighted the necessity of using AI to simplify the management of complex data through the utilisation of Optical Character Recognition (OCR) for validating journal entries. In addition, through the comments given by the auditors regarding AI's ability to effectively manage large and different data sets, it shows the role of AI in improving the accuracy and precision of audits, thereby increasing the confidence and reliability of audit results.

Enhancing Audit Standards

This subtheme specifically examined how AI raised higher audit standards by assisting in substantive testing and improving the overall quality of audits. Auditors' responses highlighted the complex yet important role of AI in facilitating comprehensive transaction testing and improving the quality of audit evidence. This was important to maintain strict audit standards.

Technological and Operational Challenges in AI Integration

There have been several challenges encountered when integrating AI into the auditing process. This section examined the challenges encountered by auditors in both technology and operations when incorporating AI into their daily audit duties, as shown by the NVivo analysis. These challenges were important because they highlighted areas of conflict that hindered the smooth integration of AI technology in auditing, which required strategic management and solutions.

Technological Challenges: Constraints in Hardware

In regard to technology, the auditors emphasized the importance of hardware-related challenges to ensuring the efficiency of AI technology. Limited laptop storage, especially when dealing with huge data sets, was a common problem in audits. Insufficient hardware impaired the performance of AI tools and further limited AI ability to enhance its data processing and analysis capabilities. Limited hardware not only prevented an effective audit process, but it also impacted the quality and speed of data processing, both of which are essential in providing timely dependable audit results.

Operational Challenges: Software Transition

A significant operational challenge in the integration of AI was ensuring continuous and consistent application of AI during subsequent cycle of audits. The auditors highlighted the persistent issues that arose during the software transition process. While the tagging and mapping process improved with time, changes in the software used by the client brought back the problems that occurred at the initial stage once again, further disrupting the workflow and audit efficiency. This situation highlighted the primary operational challenges associated with the incorporation of AI. By using AI, the audit process may be strengthened and sustained effectively even in a dynamic setting where the client's technology was continually changing.

Enhancement Brought by AI in Auditing

The integration of AI in the auditing field has significantly improved data processing and risk management capabilities, hence changing traditional audit procedures. This section explained the role of AI in the field of auditing, specifically its impact on the processing of big data and the mitigation of audit risks.

Big Data Processing

Auditor 1 emphasized the significance of AI in simplifying the management of large amounts of data, enabling auditors to ensure consistency across various accounts or ledgers, such as cash sales and credit sales. This function not only simplified the audit process but also improved the accuracy and dependability of financial records by providing proper verification.

Audit Risk Reduction

As per Auditor 2, AI enabled auditors use a more comprehensive auditing strategy by enabling them to assess entire data sets instead of depending on samples. By using this method, the likelihood of errors or omissions occurring throughout the audit process could be diminished. Enhanced audit quality and reliability were achieved as each transaction was carefully examined and accounted for.

CONCLUSION

This study has brought a number of theoretical contextual queries closer to being answered. Applying the theory of Technology Organization Environment (TOE), the study highlighted on the challenges faced by the audit firms in Malaysia when using AI in audits and how AI transformed the audit process (Awa, 2017).

The findings highlighted the challenges faced in adopting AI in auditing, particularly the technological constraints posed by limited hardware. Inadequate hardware hampered the effectiveness of the audit process and negatively impacted the quality and speed of data processing, both of which are essential for delivering timely and reliable audit results. Another obstacle to applying AI in auditing was the operational challenges associated with software transition. A major concern in integrating AI was maintaining its consistent and ongoing application across subsequent audit cycles. Auditors had reported persistent issues that arose during the software transition process where changes in the client's software can reintroduce the initial problems, further disrupting the audit process. This findings are in line with prior research (Hamdan et al., 2024; Aitkazinov, 2023; Chowdhury, 2021) highlighting the need for an organization to ensure that the technology is updated so that the audit will be effective and efficient.

The finding contributes to today's practitioners, auditors, and corporate practices the benefits of AI in auditing and factors to consider in their auditing process especially in big organizations (Big 4 audit firms). This study highlighted that for audit firms to apply AI in auditing, it is essential to have sufficient technological resources and to consistently update their software to effectively navigate the challenges of this transition.

From the theoretical contribution, this study contributes to knowledge on AIs use in auditing that stems from the Machine Learning Model, particularly in the developing audit market. This study also stipulated a signal for higher learning institutions in Malaysia to review the curriculum to take into consideration the application of AI in the audit syllabus. Many AI tools have recently been introduced in education that simplify tasks for students, such as ChatGPT and EditGPT. As a result, the theory of AI in auditing learned in formal higher education is anticipated to be particularly beneficial in practical applications.

This study was conducted during the Covid-19 pandemic, which may have constrained the findings since the data collected represented a specific time period. Furthermore, the focus on the Big 4 audit firms in Malaysia means that the results related to the application of AI may not be relevant to other firms, especially medium and small-sized ones. As a result, future research should investigate the application of AI in non-Big 4 audit firms in Malaysia.

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Ownership Structure and Firm Performance in Malaysia: The Moderating Effect of Corruption Risk

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ABSTRACT

The purpose of this study was to examine the effects of ownership structure on firm performance and the interaction effect of a firm's corruption risk with the ownership structure. Data were collected from the annual reports of 280 Malaysian public listed firms over the period 2018 to 2022. Multiple regression analyses were run to assess the empirical status of the research hypotheses. For direct relationship, the results showed a positive and significant relationship between foreign ownership and firm performance, while family ownership and institutional ownership had no significant relationship with firm performance. For interaction effect, there was evidence of corruption risk having a moderating effect on the positive influence of family, foreign, and institutional ownership against firm performance. The key results of the study are beneficial to highlight the roles of family, foreign, and institutional shareholders in accelerating firm performance, even though the Malaysian business environment is vulnerable to corruption risks. The originality of this study lies on the role of corruption risk in weakening or strengthening the ownership structure-firm performance relationship. This study makes a novel contribution to business players, shareholders, academicians, professionals, policymakers, and regulators. Limitations and future directions of the study are also discussed.

Keywords: Corruption Risk, Anti-Corruption, Corruption, Ownership Structure, Corporate Governance.

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