Impact of Artificial Intelligence (AI) on Auditors: A Thematic Analysis

Heloise Henry *is an audit associate at Deloitte UK*
Muhammad Rafique *is an Assistant Professor in Accounting at Nottingham University UK*

Abstract
Background: Artificial Intelligence (AI) has the capacity to fundamentally change the audit process. Current sampling based retrospective auditing can be replaced with real time 100% testing of the audited population. However, little is known about how the auditors will be impacted by the integration of AI in audit.
Aims: This study aims to investigate the perceptions and experiences of auditors of the impact of AI integration on audit.
Methods & procedures: Semi-structured interviews were conducted with ten participants who had current or previous experience as an auditor. Interviews were subject to thematic analysis.
Outcomes & results: It is comprehendible that for auditors to work with AI and other emerging technologies, a new set of skills is necessitated. Auditing standards need to evolve for AI to be implemented effectively.
Conclusions: The findings offer novel insights into the potential paradigm shift necessitated by the integration of AI in auditing. AI will be extensively applied to simple and repetitive audit tasks allowing auditors to focus on activities requiring professional judgement. Continuous auditing may relieve year-end pressures and positively impact the working patterns of the auditors.
Key words: artificial intelligence (AI), continuous auditing, AI ethics, auditor training, thematic analysis

----

I.   Introduction

The objective of an audit is to form an independent opinion on the financial statements of the audited entity. ISA 500 (Audit Evidence) requires auditors to obtain sufficient appropriate evidence to support the audit opinion, given that it is virtually impossible to test the whole data population of a large entity. Therefore, currently a sample is selected and tested. Artificial intelligence (AI hereafter) is described by some, i.e., Ukpong et al. (2019); Karanicolas (2019); and Ponce (2018) as a game changer, because it has the potential to fundamentally change the audit process. AI enables the analysis of the full population of data and can identify outliers and exceptions (Boillet, 2018) consequently by using AI, 100% real-time audit testing can be achieved.

Artificial Intelligence is 'a hybrid set of technologies supplementing and changing the audit' (Issa, et al., 2016: 3) it is not a monolithic technology (Likens, 2020) and vast volumes of data from various internal and external sources can be processed and analysed (Kokina & Davenport, 2017) as software algorithms automate complex decision-making tasks to mimic human thought processes and senses (Likens, 2020).

Academic research in AI started in 1997 (Wen, 2020) when the first paper on the topic of 'artificial intelligence and accounting' was published. However, no research paper on the concept of AI and auditing was published until 2010. A systematic review of the literature, conducted by Wen (2020) found 40 journal articles between 2010 and 2019. Though many authors such as: Shimamoto (2018), Bowling and Meyer (2019), Dickey et al (2019), and Lin and Hazelbaker (2019) have focused on the conceptual aspects of the phenomenon. Therefore, despite recent upsurge, the empirical literature on the impact of AI on auditors is scant.

The adoption of new technologies in audit has previously been slow (Oldhouser, 2016; Krieger et al., 2021), but the impact of AI in audit is expected to be substantial because of the availability of data and processing power (Kokina & Davenport, 2017). Therefore, it is important to determine the impact of AI on auditors. The main objective of this study is to explore the perceptions and experiences of auditors about the integration of AI in audit. In order to meet this objective, this study raises the following question: How will auditors be impacted by the integration of AI in audit?

Our study contributes to the literature and practice in a number of ways. Firstly, we add to the work of Issa et al. (2016) and Kokina & Davenport (2017) by including participants from the big 4 as well as small audit firms. Secondly, we focus on the training needs of auditors and the ethical implications of integrating AI into auditing. Thirdly, our work provides evidence that it is of value to standard-setters and practitioners to consider

---

the aptness of current auditing and ethical standards in conjunction with AI integration. Finally, we add the concept of continuous auditing to the existing literature and its impact on the working patterns of auditors.

The remainder of this paper is organised as follows. In Section 2, the literature is reviewed, and in Section 3, the research design is presented. The findings of this study are discussed in Section 4. Finally, we provide a conclusion in Section 5.

II.   Literature Review

The ability of Artificial Intelligence to perform cognitive work has the potential to alleviate challenges in audit, hence motivating its implementation and application. Etheridge, et al. (2000) highlight the challenge of current sample-based audit processes because the auditors are unable to examine all client information. Not being able to test 100% of the clients' data makes it harder for auditors to express a sound opinion on a company's financial health. Moreover, Gotthardt, et al. (2020) draw attention to inefficient processes and systems currently used in audit which can result in lags, errors, outdated data, and financial loss. In addition to the opportunity for AI to improve these audit processes and systems, Kokina & Davenport (2017) and Issa, et al. (2016) emphasise that AI is suitable for the labour-intensive manual audit processes.

Academic literature, e.g. (Kokina & Davenport, 2017; Moffitt, et al., 2018; Moll & Yigitbasioglu, 2019), indicates that the main application of AI in audit is expected to be for structured and repetitive tasks. This view is also supported by practitioners (EY, 2019; PwC, 2017) who emphasise the use of AI to carry out the standardised and repeatable elements of the audit. However, Bowling & Meyer (2019) assert that AI is practicable for small audit firms as all entries in the general ledger can be effectively analysed. In fact, as opposed to conducting audit testing on a sample basis, AI can be utilised to test entire population of data to detect risk, anomalies, and fraud (Deloitte, 2017). Big 4 firms currently use AI for data analysis and risk assessment (Deloitte, 2016; EY, 2019; KPMG, 2018; PwC, 2017).

In practice, in addition to data analysis and risk assessment, AI is used by big 4 firms (Deloitte, 2016; EY, 2018; KPMG, 2018; PwC, 2018) for document review. AI enables the automatic identification and extraction of required information from any electronic document. This feature enables further audit evidence to be gathered in a shorter time frame and more precisely than the average human auditor (EY, 2018). Furthermore, AI has also been applied alongside drones for inventory counts which negates the need for auditors to complete this task physically (PwC, 2019a). Appelbaum, et al. (2020) emphasise the benefit of this application and its increasing use due to the COVID-19 pandemic in-person restrictions.

Fraud detection is an alternative use of AI, suggested by Dickey, et al. (2019) who infer from previous literature that AI capabilities of speech and facial recognition can be beneficial in fraud interviews, although it is not currently in use. Elements of audit process covered by AI may include: analytical review procedures (Kokina & Davenport, 2017); internal controls evaluations (PwC, 2019b); going concern (Munoko, et al., 2020); and, continuous auditing (Raschke, et al., 2018).

Automation of structured and repetitive audit tasks (e.g., Moffitt, et al., 2018; Moll & Yigitbasioglu, 2019) means that auditors can reallocate their time away from menial tasks, to focus on high-value assignments (Kruskopf, et al., 2020; Shimamoto, 2018). Focus of human involvement would turn to tasks which are too narrow or uncommon for it to be economical to apply AI (Kokina & Davenport, 2017). As AI assists in data collection and analysis, there will be increasing amounts of data and information for auditors to use, therefore, part of auditors' jobs will be to interpret the results produced by AI (Issa et al., 2016), recognise relevant facts and figures and make informed decisions (Kruskopf, et al., 2020). New insights generated from data would help in designing effective controls, improved performance (Shimamoto, 2018), enhanced audit quality and better value to clients (Raphael, 2017).

In addition to the new activities conceived for working alongside AI, Haq, et al. (2020) emphasise the requirement for auditors to possess superior technical expertise to understand algorithms used so that they can explain the reasoning for decisions, as required by current audit standards. This modification of auditors' knowledge is also supported by Dickey et al. (2019), who suggest that the future auditor will need a solid understanding of information systems, data science and general business.

The integration of AI in audit will impose significant changes which auditors will need to prepare for (Lin & Hazelbaker, 2019). Therefore, the training for new auditors will have to change to ensure they have the correct skills, knowledge, and experience to work in the new AI-audit environment (Giles, 2019). Subject knowledge is an essential requirement for auditors, but there is risk that overreliance on technology might lead to an oversight in this area. Some recent studies by Tsiligiris and Bowyer (2021) and Jackson and Meek (2021) argue that subject knowledge is at the core of accountants' skills and despite the flux of expectations about the role of technology, accounting and auditing knowledge remain key pre-requisites for the success of future accountants and auditors.

To prepare the future auditor, accounting curricula need to be adapted to incorporate AI and other emerging technologies that become essential in the profession (Drew & Tysiac, 2020; Issa, et al., 2016; Munoko, et al., 2020; Qasim & Kharbat, 2020). Furthermore, Munoko et al. (2020) advocate that audit firms implementing AI offer training in emerging technologies to continuously enhance their employees' competencies.

A significant change in skills suggested by Kruskopf et al. (2020) is the focus on social skills which will be needed to bridge the gap between humans and machines. The shift to social skills focuses on communication, conflict resolution, versatility, emotional intelligence, creativity, and customer service orientation. While much of the literature calls for a change of skill set for the future auditor (Dickey, et al., 2019; Haq, et al., 2020; Kruskopf, et al., 2020), many emphasise the traditional skill of professional judgement being especially important. Omoteso (2012) explains the use of AI to only support auditors because machines do not possess human traits required for complex judgement, meaning the auditor is always ultimately responsible for decision making. The same view is given by Alexander (2018), stating that although AI may detect something considered unusual, this does not mean it is wrong, therefore, auditors must apply professional judgment and scepticism to review automated procedures.

Some authors, i.e., Munoko, et al. (2020), Dickey, et al. (2019) and Issa et al. (2016) draw attention to the potential ethical challenges with specific reference to the International Standards on Auditing (ISAs) and International Standards Board for Accountants (IESBA) requirements. The principles of independence, due professional care, objectivity, and confidentiality required by auditors in the code of ethics (IESBA, 2018) may be compromised with the use of AI (Munoko, et al., 2020). Auditors may become over-reliant on outcomes of AI systems if they fail to investigate data or dispute results (Dickey, et al., 2019). This presents an ethical issue because the professional judgement and scepticism required by auditors under ISA 200 (FRC, 2020) would be undermined (Munoko, et al., 2020). Independence may be compromised again due to overreliance on AI for certain tasks such as internal control evaluations (Issa, et al., 2016). Due professional care requires auditors to explain the rationale for their decisions (IESBA, 2018). This could be impaired when using AI because of its complexity and lack of transparency which make it challenging for auditors to understand justifications behind AI outcomes (Munoko, et al., 2020).

III.   Research Design
3.1   Data collection and recruitment
We seek to explore the impact of the integration of Artificial Intelligence in audit by adopting a qualitative research methodology. This design is selected to elucidate the perceptions and thoughts of the auditors, as the auditors are impacted by the AI integration in auditing. Qualitative inquiry is ideally suited for explicating subjective meaning, perspectives and interpretations which may otherwise remain concealed (Willig, 2001). As such, the present study is informed by a constructivist paradigm, in which meanings and experiences are perceived to originate from social interaction and discourse rather than residing within the individual (Guba & Lincoln, 1994). The participants and researchers were actively involved in constructing meaning through dialogue. Thus, meaning making is co-constructed through the interview process itself.

Participants were contacted by the field researcher (HH) via email or social media sites, such as Linked-In, with a brief explanation of the research and a request to arrange an online meeting. 19 potential participants were invited to take part in the study, of which, 10 agreed. Eight of these participants are based in the UK and two in British channel island of Jersey. According to Saunders, et al. (2016), this is considered a suitable number of participants for an exploratory study to enable deep analysis of information through semi-structured interviews. The semi-structured interviews lasted approximately 25 – 30 minutes each. All these participants were provided with the information sheet with full details of the project as required by the Nottingham University research ethics protocol.

Due to the COVID-19 pandemic, all interviews were conducted online using Zoom or Microsoft Teams. This provided greater convenience than face-to-face interviews. Furthermore, all participants agreed to their interview being recorded. This was beneficial so that the interviewer could stay alert and for interviews to be transcribed afterwards (Bryman, 2015). Interviews were conducted between December 2020 and February 2021. The digital recording avoided any data loss and listening to the interview recordings before the data analysis provided an early indication of the codes and themes. Data from transcripts was organised in a spreadsheet to identify relevant excerpts and to find themes.

3.2   Analytical Technique
        The raw data of the semi-structured interviews was systematically analysed through the means of data-driven thematic analysis. Thematic analysis is a powerful analytical tool with which the researchers can 'identify, organise, analyse, and report the finding patterns' in the data corpus (Braun and Clarke 2012). The approach employed in this study was inspired by the general guidelines of Braun and Clarke's (2006) six-step thematic analysis framework involving: (i) getting familiar with the data through transcription; (ii) generating initial codes; (iii) searching for themes; (iv) reviewing themes; (v) defining and naming themes; and (vi) producing the final written output. However, the analysis was not a linear process of moving forward through the six steps. Braun and Clarke (2020) acknowledge the recursive and iterative nature of the analysis in which the researcher must move back and forth through the steps as necessary.
        To get familiar with the data, the field researcher (HH) listened to each interview recording before transcribing. This playback of each interview required active listening which was necessary to develop an understanding of the primary areas addressed in each interview prior to transcription. To generate initial codes, we worked through the entire data set systematically to identify informative and interesting data items suitable to develop themes. After coding all relevant data items, we moved from the interpretation of individual data items within the dataset, to the interpretation of aggregated meaning and meaningfulness across the dataset. This exercise enabled us to develop a thematic table that collated codes and data items relative to their respective themes (Braun and Clarke 2012).
        Whilst reviewing themes, we conducted a recursive review of the themes regarding the coded data items and the entire dataset (Braun and Clarke, 2020) to ensure that themes identified, provided pertinent interpretation of the data in relation to the research question. Subsequently, we conducted a deep analysis of the underlying data items to define and name themes. We identified extracts that provide a vivid and compelling account of the arguments being made by a respective theme. Each extract is interpreted in relation to its constitutive theme, as well as the broader context of the research question to create an analytic narrative that informs the reader what is interesting about this extract and why (Braun and Clarke 2012).
        From the thematic analysis, five main themes emerged, each of them with multiple dimensions and expressions, based on the patterns of the participants' responses. The five themes are: (i) Application of AI in audit, (ii) Impact of AI on auditors' tasks, (iii) Impact of AI on auditors' knowledge and skills, (iv) Impact of AI on auditors' training, and (v) Ethical implications of AI for auditors.

IV.   Findings and Discussion

4.1   Applications of AI in Audit
Various applications of AI in audit were suggested by participants during interviews. There was an overarching theme that AI will be primarily used for mundane and repetitive tasks.

 "We should be able to use artificial intelligence to replace a lot of manual repetitive tasks that we usually have to do." Participant6

Also, *"... it'll rid of some of the mundane checking of certain things. I think you'll get rid of some of the grunt work, so the boring stuff."* Participant10

This finding supports both academics and practitioners who generally emphasise the application of AI in audit for structured and repetitive tasks (e.g. EY, 2019; Kokina & Davenport, 2017; Moffitt, et al., 2018; Moll & Yigitbasioglu, 2019; PwC, 2017).

The most common application of AI in the interview data was for audit samples as AI allows for full population testing to enable irregularities to be detected more easily than with manual processes.

"The normal standard auditing approach is we use it on a sample basis, we don't test all of the items. When we use artificial intelligence, if we can cover off more items that will help us be more confident when we issue our opinions." Participant5

"Instead of taking a sample, however large that might be or thorough, you can look at every transaction from that overview and have the intelligence within the system draw out things that you might want to look at." Participant7

In the interviews, participants highlighted AI's ability to analyse all information for journal entry testing using certain parameters to find items outside the usual pattern that require auditor attention. The participants suggested that this application will help to identify anomalies, risks and fraud, as well as enable continuous

auditing and reduce human error. This brings time saving advantages and increased confidence when issuing an opinion. Although the application of AI for fraud detection was recognised in the interviews, some participants specified the limitation of its use due to human judgement being required.

These findings align with evidence from practitioners in the literature review as the evaluation of an entire population is used to identify risks, anomalies, and fraud (Deloitte, 2016; EY, 2019; KPMG, 2018; PwC, 2017). Moreover, the requirement for human judgment in fraud mentioned in the interviews is recognised in a general audit context by Omoteso (2012).

Besides journal entry testing, the application of AI for contract reading was used by some participants' firms. For example, Participant1 said:

"We do use it for contract reading at the moment, so when there's lots of things like insurance contracts or bank contracts and things, then you can use that to automatically read through it and interpret clauses and things like that. It's still relatively straightforward though."

The application of AI for contract reading is encompassed within document review as a current use of AI at all Big 4 firms identified in the literature review (Deloitte, 2016; EY, 2018; KPMG, 2018; PwC, 2018). Participant1's distinction of this application being *"relatively straightforward"* suggests potential advancement of contract reading in the future although this was not specifically highlighted in the literature.

Another significant theme from the interviews was the benefits of using AI alongside other technologies. Integrating AI and data analytics was suggested to help increase value for clients and increase the quality of audit. Furthermore, participants explained the potential application of AI with drones for inventory counts, but it was not recognised a current use. This was recognised in the literature as a current application (PwC, 2019a) but limited implementation in audit firms may explain this discrepancy.

4.2   Impact of AI on Auditors' Tasks
The predominant theme in relation to the impact of AI on auditors' day-to-day activities is that it will enable auditors to focus their time on higher value activities. The automation of simple and repetitive tasks as identified from the interviews and literature will make audits more efficient as auditors will spend less time on these tasks. The explanation given by Participant4 below supports this view:

"When it comes to the more mundane, simple tasks, there's really the strive to include technology in that as AI becomes more widely used and people become more comfortable with it. We're trying to implement it more to those simple things and I think in an audit perspective it will be all about trying to make things more efficient and trying to do things to cut down on time so that humans can act as auditors and can focus more on the judgment areas and more on the complex work within audit."

Similarly, Participant6 asserts that:
"...as we move more into an AI space, I do think we're able to provide comfort in the simpler areas a lot faster and more efficiently for stakeholders and therefore we're able to focus on the more judgmental parts."

By integrating AI into auditing; mundane, simple and routine tasks can be automated, according to participants 3,4 and 6. Participant 4 suggested that if AI is implemented for continuous auditing, the auditors will focus on complex parts of the audit where human judgement is required, while simple, mundane and repetitive tasks can be automated. This can lead to reduced overtime and less pressure on auditors at the year-end. The implementation of AI for continuous auditing was mentioned in their research note by Raschke, et al., (2018) but this study offers new insight regarding the practicability of continuous auditing, which was not identified in the literature.

The primary area identified by participants for auditors to focus their time was on tasks involving human judgement. This will be elaborated on later as human judgement is considered a skill impacted by the implementation of AI.

Participants also suggested that auditors can focus their time on areas of greater stakeholder interest such as adding value for clients by taking a more advisory role (for example participant 3). However, in the context of auditors' tasks, none of the participants mentioned the ethical dilemmas associated with advisory and value-adding roles. A similar view is reflected by Shimamoto (2018) and Raphael (2017) as they recognise a greater

client focus. However, the ethical issue of undermining auditor independence should be considered if auditors take on management responsibility in an advisory role (Munoko, et al., 2020).

Another finding from the interview data about how AI will impact auditors' tasks was that auditors will need to spend time understanding AI systems and outputs. Participants note that auditors will need to check the accuracy of data, comprehend data and interpret results in order for AI to be implemented effectively.

"[AI] still needs to be checked by person and so it might involve different types of skills and being able to liaise with developers for example." Participant3

"I think the AI can pull out all the work that we need to look at further and definitely refine the work that we're doing, and then humans will comprehend that work and interpret it." Participant4

This finding supports Issa et al. (2016) who suggest the focus on interpretation of results produced by AI. It also builds on Kokina & Davenport's (2017) new activities of monitoring and improving intelligent machines' performance, overseeing the use of AI to determine if alternative automation tools are needed, and developing new AI-based technologies. However, the participants' opinions of whether it is the responsibility of specialist IT (information technology) teams or auditors to develop AI technologies varied; In this context, Participant2 states:
"I think it will require a combination of both IT specialists and auditors to develop these AI systems. There may be either IT teams or external companies who create AI features, but then the auditors will need to test it."

Also, *"I think you've got to build the infrastructure in the background that you've got to have IT people around and IT people who understand audit which there aren't that many of at the moment".* Participant9

Both Participant2 and Participant9 work at a small audit firm, while one participant from a Big 4 firm stated that there will be more IT support staff to understand clients' AI systems. These quotations alongside other common responses suggest the need for IT specialists and auditors to liaise with one another in the implementation of AI in audit.

4.3   Impact of AI on Auditors' Knowledge, Skills and Practice
          The changes in auditors' tasks closely relate to the impact AI will have on auditors' knowledge and skills. Although the interview data was unclear as to whether auditors will have a new task to develop AI systems, a common view amongst participants was that auditors will require greater technological knowledge and skills; for example, Participant 1 argues:

"I think you've got to have the technical side in terms of being able to evaluate that data, how the model actually works and how this stuff is run."

Similarly,: *"We're going to have to say "You know what? Yes, I can tick and tie an invoice, but I can also analyse software, I can also read outputs." So we're going to definitely have to upskill in that respect as well."* Participant5
And,
"So I think a big focus towards IT skills and so they're training up the professionals we already have in terms of you know, coding, language, building new tools, etc." Participant6:

The technological knowledge and skills identified in interviews included analysing and evaluating data, interpreting outputs, understanding AI systems and coding. This finding is consistent with Haq, et al., (2020) and Dickey et al., (2019) who both emphasise future auditors needing technical expertise. Moreover, it corroborates the increased technical skills such as analytics and coding recommended by Kruskopf, et al., (2020).

The potential focus on social skills proposed by Kruskopf et al. (2020) was also supported by the interview data. Participants felt that human elements of audit cannot be replaced by AI, therefore, more value will be placed on human interaction and intuitive skills; for example

"I think that client interaction is something that can never be replaced. I also think that the client would be more sceptical of [AI] than us as the auditors being sceptical of the user. I think there would be client pushback on not having that human element if they had to answer to a machine." Participant4

"It's still going to be quite heavily related to human interaction, and they're still going to need that as much as they ever have done to get their clients on board." Participant8

The interviews specifically aligned with social skills of communication and customer service orientation (Kruskopf, et al., 2020). A common explanation for auditors needing these social skills with the integration of AI was to provide reassurance to clients as illustrated in the quotations above. However, the findings contradict Raschke, et al. (2018) who propose that applying AI would reduce time required for client interactions.

Moreover, the participants were unanimous in the view that human judgement will be very important following the implementation of AI in audit. The evidence below illustrates this theme of human judgement being a required skill of auditors:

"... there is always going to be that involvement for the human element of namely professional judgment and professional scepticism to be able to question the client and make sure we get the required explanations that we need." Participant5

"There's no amount of computing power is going to be able to replace a human being making a judgment about whether a particular accounting disclosure is right." Participant8

"The role of the auditor will still remain because estimates and judgments and things like that, AI can't necessarily do that for you... there is a big role for auditors, but maybe it's a slightly different level going forward I would say." Participant9

The interview data suggests that human judgement is especially important because it cannot be easily replicated by AI. This finding is consistent with Omoteso (2012) and Alexander (2018) who also emphasise that auditors should exercise professional judgement and scepticism when using AI.

4.4 Impact of AI on Auditors' Training

All but one participant believed training for auditors should change following the integration of AI in audit. The participant who did not feel training needs to change thought that the training nevertheless will change. *"I think it will change. I'm not convinced it necessarily has to change."* (Participant8).

All other participants thought that the auditors will need to receive training to develop the new knowledge and skills, such as understanding AI systems and coding. Moreover, some participants detailed the training they have received; for example: Participant2: *"So in ACA with ICAEW, they do include a section on technology to learn about artificial intelligence."* and

"Whenever there's new stuff like apps for us to use there's always a training session and they'll explain how it works so that we all get used to it." Participant4

These results find support from the literature that AI should be incorporated into training for future auditors (Drew & Tysiac, 2020; Giles, 2019; Munoko, et al., 2020). It also closely aligns with Munoko et al.'s (2020) encouragement for firms to offer training in emerging technologies.

An unanticipated finding regarding the change in auditor training following the implementation of AI was the need to increase audit training as well. The potential deskilling of auditors due to AI, explained by Munoko, et al., (2020) and Sutton, et al., (2016), was recognised by some participants but elaborated on with the suggestion that new auditors will need greater initial audit training. In this context, Participant 4 argues:

"I think it will be that auditors entering the profession will need to possibly be trained on the basics of the audit more because we're moving so much into technology, the more basic areas of audit younger people may not now end up doing and then they won't actually have that base knowledge of where everything comes from."

Training is encouraged by practitioners and professional accountancy bodies. For example, Raphael (2017) from Deloitte suggests combining instruction with hands-on experience to prepare auditors to use AI and other technologies. Furthermore, Institute of Chartered Accountants in England and Wales have revised the syllabus (ICAEW, 2019) for the ACA qualification and have incorporated emerging technologies through knowledge, practical learning and examinations.

4.5   Ethical Implications of AI to Auditors
        The participants were specifically asked about the ethical implications of implementing AI in audit. The interview data reveals that there are copious ethical implications because all participants named at least one ethical issue. For instance, Participant1 stated, *"There are loads of ethical implications, AI as a whole is an ethical minefield".* The prominent areas identified by participants were inherent bias, job loss, overreliance, security, and lack of understanding.

"I think the biggest thing is about making sure that the data going in isn't introducing inherent biases." Participant1; *"There could be an ethical issue if AI takes out swathes of jobs in audit."* Participant2; also,

: "A big risk is just reliance upon it… that you just take it at face value, and you don't do any further work to make sure that it's right" Participant3*;*

: "I think there are issues in terms of data protection, the security of it, whether the data might get wiped out or whether there's a cyber-attack." Participant7*; and*

"… I don't think [auditors] really understand what the technology is doing and how it works, and within ISA 220, that's a bit of a problem because they're required to understand everything that they do." Participant8.

The interview data supports the ethical implications of AI in audit that were highlighted in the literature review (Munoko, et al., 2020). This therefore suggests that auditors may face ethical challenges following the implementation of AI. Some of the ethical issues presented prompted participants 3 and 7 to suggest that accounting and auditing standards need to evolve for AI to be implemented effectively. Participant 8 made a specific reference to ISA 220 (Quality Control for an audit of Financial Statements) to emphasise the importance of having a deeper understanding of AI before placing reliance on it. This is consistent with the literature, for example see (Dickey, et al., 2019; Haq, et al., 2020; Kruskopf, et al., 2020) points towards auditors needing a more advanced skill set.

A number of participants also raised concerns about the possibility of AI replacing jobs in audit as being an ethical issue, which supports Munoko, et al.'s (2020) argument of social and economic impacts of AI. When discussing how the participants felt about the implementation of AI in audit, none felt threatened. The interview data seems to contradict Frey & Osborne (2017) who predicted the extinction of the profession and instead aligns with the augmented role of the auditor proposed in the literature (Kokina & Davenport, 2017; Brazina & Ugras, 2018;).

Recent up rise in ransomware attacks raises the question of data security and may result in delayed or partial integration of AI in auditing. The participants felt that ethical issues around security and challenges within the standards could hinder of implementation of AI in audit. The issue of data security and its impact on the delayed or partial implementation of AI in audit does not seem to be addressed in the current literature; this is an area worth researching.

V.   Conclusion
        The objective of this study is to explore the perceptions and experiences of auditors about the integration of AI in audit. Based on the thematic analysis of interview data, it can be concluded that various audit tasks will be automated by AI which will create a new focus for auditors' activities. Working alongside AI will require different knowledge, skills and training for auditors and presents ethical implications which should be considered.
        The findings of this study indicate that AI is extensively applied in audit firms of all sizes to the simple and repetitive audit tasks with the most beneficial application being full population testing. This will impact auditors by allowing them to spend more time on high value activities and exercising professional judgement. Auditors will require more advanced technological knowledge and skills to implement and use AI systems, but human qualities of communication and judgement will also become increasingly important. Training in AI is encouraged for current and future auditors through accounting curricula, firm training and by taking a proactive approach., The findings also show that AI will have various ethical implications for auditors under the code of ethics and standards. Therefore, auditors should consider potential ethical breaches when using AI. Accounting, auditing, and ethical standards may need to evolve to facilitate AI applications.

Our findings must be interpreted in the context of a number of limitations. Although the sample is appropriate for an exploratory study of this nature, it is not substantially large and future studies can improve on the sample size. This research focused specifically on the impact to auditors but firms, clients, technology companies and regulatory bodies, for example, will also be affected by the implementation of AI in audit. Therefore, future studies could conduct similar research with an alternative focus to provide implications for these stakeholders. Furthermore, future research may outline how to prepare for AI applications in audit because ethical issues and other challenges may otherwise prevent AI being successfully implemented.

References

[1]. Alexander, A. (2018). Changing tools, changing roles; Technology is driving the audit of the future. *Accounting Today,* 32(3), p. 10.
[2]. Appelbaum, D., Budnik, S. & Vasarhelyi, M. (2020). Auditing and Accounting During and After the COVID-19 Crisis. *The CPA journal,* 90(6), pp. 14-19.
[3]. Boillet, J. (2018). Why AI is a risk and a way to manage risk. https://www.ey.com/en_uk/assurance/why-ai-is-both-a-risk-and-a-way-to-manage-risk
[4]. Bowling, S. & Meyer, C. (2019). How we Successfully Implemented AI in Audit. *Journal of Accountancy,* 227(5), pp. 26-28.
[5]. Braun, V. & Clarke, V. (2006). Using Thematic Analysis in Psychology. *Qualitative Research in Psychology,* 3(2), pp. 77-101.
[6]. Braun, V. & Clarke, V. (2012). Thematic analysis. In H. Cooper, P. M. Camic, D. L. Long, A. T. Panter, D. Rindskopf, & K. J. Sher (Eds.), APA handbook of research methods in psychology, Vol. 2: Research designs: Quantitative, qualitative, neuropsychological, and biological (pp. 57-71). Washington, DC: American Psychological Association.
[7]. Braun, V., & Clarke, V. (2020). One size fits all? What counts as quality practice in (reflexive) thematic analysis? *Qualitative Research in Psychology.* Advance online publication. https://doi.org/10.1080/14780887.2020.1769238
[8]. Brazina, P. R. & Ugras, Y. J. (2018). Accounting Automation: A Threat to CPAs or an Opportunity? *Pennsylvania CPA Journal,* 89(2), pp. 18-21.
[9]. Bryman, A. (2015). *Social Research Methods.* 5 ed. Oxford: Oxford University Press.
[10]. Deloitte (2016). *Why Artificial Intelligence is a Game Changer for Risk Management.* Online] Availab[le at: https://www2.deloitte.com/content/dam/Deloitte/us/Documents/audit/us-ai-risk-powers-performance.pdf [Accessed 18 November 2020].
[11]. Deloitte (2017). *Delivering Smarter Audits.* [Online] Available at: https://www2.deloitte.com/content/dam/Deloitte/us/Documents/audit/us-audit-smarter-audits-dynamic-insights-through-innovation.pdf [Accessed 17 November 2020].
[12]. Dickey, G., Blanke, S. & Seaton, L. (2019). Machine Learning in Auditing: Current and Future Applications. *The CPA Journal,* 89(6), pp. 16-21.
[13]. Drew, J. & Tysiac, K. (2020). 2020s vision: Tech Transformation on Tap. *Journal of Accountancy,* 229(1), pp. 26-32.
[14]. Etheridge, H. L., Sriram, R. S. & Hsu, H. Y. K. (2000). A Comparison of Selected Artificial Neural Networks that Help Auditors Evaluate Client Financial Viability. *Decision Sciences,* 31(2), pp. 531-550.
[15]. EY (2018). *How AI will Transform the Audit.* [Online] Available at: https://www.ey.com/en_uk/assurance/how-artificial-intelligence-will-transform-the-audit [Accessed 15 November 2020].
[16]. EY (2019). *How an AI Application Can Help Auditors Detect Fraud.* [Online] Available at: https://www.ey.com/en_uk/better-begins-with-you/how-an-ai-application-can-help-auditors-detect-fraud [Accessed 20 November 2020].
[17]. FRC (2020). *International Standard on Auditing (ISA)(UK) 200: Overall Objectives of the Independent Auditor and the Conduct of an Audit in Accordance with International Standards on Auditing (UK).* [Online] Available at: https://www.frc.org.uk/getattachment/aa24dd60-5ca4-4cec-8c67-ac470b82f931/ISA-(UK)-200_Revised-June-2016.pdf [Accessed 4 November 2020].
[18]. Frey, C. B. & Osborne, M. A. (2017). The Future of Employment: How Susceptible are Jobs to Computerisation? *Technological Forecasting & Social Change,* 114, pp. 254-280.
[19]. Giles, K. M. (2019). *How Artificial Intelligence and Machine Learning Will Change the Future of Financial Auditing: An Analysis of The University of Tennessee's Accounting Graduate Curriculum.* Chancellor's Honours Program Projects. [Online] Available at: https://trace.tennessee.edu/utk_chanhonoproj/2259 [Accessed 5 Novmember 2020].
[20]. Gotthardt, M., Koivulaakso, D., Paksoy, O., Saramo, C., Martikainen, M. & Lehner, O., (2020). Current State and Challenges in the Implementation of Smart Robotic Process Automation in Accounting and Auditing. *CRN Journal of Finance and Risk Perspectives,* 9(1), pp. 90-102.
[21]. Guba, E.G., & Lincoln, Y.S. (1994). Competing paradigms in qualitative research. *Handbook of qualitative research,* 2(163-194), p.105.
[22]. Haq, I., Abatemarco, M. & Hoops, J. (2020). The Development of Machine Learning and its Implications for Public Accounting. *The CPA Journal,* 90(6), pp. 6-9.
[23]. ICAEW (2019). *ICAEW to Incorporate Emerging Technologies into the ACA Qualification.* [Online] Available at: https://www.icaew.com/about-icaew/news/press-release-archive/2019-news-releases/icaew-to-incorporate-emerging-technologies-into-the-aca-qualification [Accessed 20 February 2021].
[24]. IESBA (2018). *International Code of Ethics for Professional Accountants.* [Online] Available at: https://www.iesbaecode.org [Accessed 17 November 2020].
[25]. ISA 500 (Audit Evidence). https://www.icaew.com/library/subject-gateways/auditing/isa-500
[26]. Issa, H., Sun, T. & Vasarhelyi, M. A., (2016). Research Ideas for Artificial Intelligence in Auditing: The Formalization of Audit and Workforce Supplementation. *Journal of Emerging Technologies in Accounting,* 13(2), pp. 1-20.
[27]. Karanicolas, M. (2019). To Err is Human, to Audit Divine: A Critical Assessment of Canada's AI Directive. *Journal of Parliamentary and Political Law,* 14, p.1.

[28]. Kokina, J. & Davenport, T. H. (2017). The Emergence of Artificial Intelligence: How Automation is Changing Auditing. *Journal of Emerging Technologies in Accounting,* 14(1), pp. 115-122.

[29]. KPMG, (2018). *Intelligent Automation.* [Online] Available at: https://home.kpmg/content/dam/kpmg/us/pdf/2016/11/us-audit-CognitiveFactSheet.pdf [Accessed 18 November 2020].

[30]. Krieger, F., Drews, P., and Velte, P. (2021). Explaining the (non-) adoption of advanced data analytics in auditing: A process theory. *International Journal of Accounting Information Systems,* Volume 41,

[31]. Kruskopf, S., Lobbas, C., Meinander, H., Söderling, K., Martikainen, M. & Lehner, O., (2020). Digital Accounting and the Human Factor: Theory and Practice. *ACRN Journal of Finance and Risk Perspectives,* 9(1), pp. 78-89.

[32]. Lin, P. & Hazelbaker, T. (2019). Meeting the Challenge of Artificial Intelligence: What CPAs Need to Know. *The CPA Journal,* 89(6), pp. 48-52.

[33]. Liken, S. (2020). Eight emerging technologies and six convergence themes you need to know about. https://www.pwc.com/us/en/tech-effect/emerging-tech/essential-eight-technologies.html [Accessed 18 November 2020].

[34]. Moffitt, K. C., Rozario, A. M. & Vasarhelyi, M. A. (2018). Robotic Process Automation for Auditing. *Journal of Emerging Technologies in Accounting,* 15(1), pp. 1-10.

[35]. Moll, J. & Yigitbasioglu, O. (2019). The Role of Internet-Related Technologies in Shaping the Work of Accountants: New directions for accounting research. *The British Accounting Review,* 51(6), p. 100833.

[36]. Munoko, I., Brown-Liburd, H. L. & Vasarhelyi, M. (2020). The Ethical Implications of Using Artificial Intelligence in Auditing. *Journal of Business Ethics,* 167, p. 209–234.

[37]. Oldhouser, M. C., (2016). *The Effects of Emerging Technologies on Data in Auditing.* Senior Theses. [Online] Available at: https://scholarcommons.sc.edu/senior_theses/68 [Accessed 10 November 2020].

[38]. Omoteso, K. (2012). The Application of Artificial Intelligence in Auditing: Looking Back to the Future. *Expert Systems With Applications,* 39(9), pp. 8490-8495.

[39]. Ponce, A. (2018). Artificial Intelligence: A Game Changer for the World of Work. *ETUI Research Paper-Foresight Brief.*

[40]. PwC (2017). *Confidence in the future - Human and Machine Collaboration in the Audit.* [Online] Available at: https://www.pwc.co.uk/audit-assurance/assets/pdf/confidence-in-the-future-human-machine-collaboration.pdf [Accessed 19 November 2020].

[41]. PwC (2018). *Harnessing the Power of AI to Transform the Detection of Fraud and Error.* [Online] Available at: https://www.pwc.com/gx/en/about/stories-from-across-the-world/harnessing-the-power-of-ai-to-transform-the-detection-of-fraud-and-error.html [Accessed 17 November 2020].

[42]. PwC (2019a). *PwC Completes its First Stock Count Audit using Drone Technology.* [Online] Available at: https://www.pwc.co.uk/press-room/press-releases/pwc-first-stock-count-audit-drones.html [Accessed 21 November 2020].

[43]. PwC (2019b). *Re-inventing Internal Controls in the Digital Age.* [Online] Available at: https://www.pwc.com/sg/en/publications/assets/reinventing-internal-controls-in-the-digital-age-201904.pdf [Accessed 24 November 2020].

[44]. Qasim, A. & Kharbat, F. F. (2020). Blockchain Technology, Business Data Analytics, and Artificial Intelligence: Use in the Accounting Profession and Ideas for Inclusion into the Accounting. *Journal of Emerging Technologies in Accounting,* 17(1), pp. 107-117.

[45]. Raphael, J. (2017). Rethinking the Audit. *Journal of Accountancy,* 223(4), p. 28.

[46]. Raschke, R. L., Saiewitz, A., Kachroo, P. & Lennard, J. B. (2018). AI-Enhanced Audit Inquiry: A Research Note. *Journal of Emerging Technologies in Accounting,* 15(2), pp. 111-116.

[47]. Saunders, M., Lewis, P. & Thornhill, A. (2016). *Research Methods for Business Students.* 7 ed. Harlow: Pearson Education.

[48]. Shimamoto, D. C. (2018). Is Artificial Intelligence a Threat to Government Accountants and Auditors? *The Journal of Government Financial Management,* 67(4), pp. 12-16.

[49]. Sutton, S. G., Holt, M. & Arnold, V. (2016). "The reports of my death are greatly exaggerated"-Artificial Intelligence Research in Accounting. *International Journal of Accounting Information Systems,* 22, pp. 60-73.

[50]. Ukpong, E.G., Udoh, I.I. and Essien, I.T. (2019). Artificial intelligence: opportunities, issues and applications in banking, accounting, and auditing in Nigeria. *Asian Journal of Economics, Business and Accounting*, pp.1-6.

[51]. Wen, Y. (2020), "A review of researches on accounting in China brought by artificial intelligence", 5th International Conference on Economics, Management, Law and Education (EMLE 2019), Atlantis Press, pp. 476-482.

[52]. Willig, C. (2001). Qualitative research in psychology: Adventures in theory and method. Buckingham: Open University Press.