



UMEÅ SCHOOL OF BUSINESS,
ECONOMICS AND STATISTICS
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Artificial Intelligence as a Disruptive Business Model in Auditing

**A study of the impact of artificial intelligence
on auditors' skills and competence, audit
process, and audit quality.**

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Abstract

Artificial Intelligence (AI) is reshaping how businesses, governments, organizations and individuals operate. Most businesses are now moving away from traditional systems of operation into employing and leveraging on technologies like AI to deliver superior goods and services to their clients. Today, there are calls for a shift from the traditional auditing techniques of sampling to the use of advanced technology with the capability to analyze all the operating activities of a business to improve audit quality. There is no better time for auditing to merge with AI than now as it is increasingly becoming too challenging for human auditors to analyze huge volumes of structured and unstructured data in various locations to gain the relevant financial and non-financial information that they may need to form their opinions.

The purpose of this research was to examine the impact of AI on auditors' skills and competencies, audit process and audit quality. The researchers used the qualitative research methodology and reviewed literature to identify gaps in the literature. Participants (practicing auditors) were interviewed to gather data for analysis.

The findings from the empirical data concludes that AI has had a significant impact on auditors' skills and competencies, with many respondents affirming that the core skills now needed by auditors is IT skills. Audit process and audit quality have also been positively affected by AI.

Keywords: Artificial Intelligence (AI), disruptive technology, auditors' skills and competence, audit process, audit quality

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Table of Contents

| | |
|---|----|
| 1.0 INTRODUCTION | 1 |
| 1.1. Background..... | 1 |
| 1.2. Problematization and Research Gap | 3 |
| 1.3. Research Question..... | 5 |
| 1.4. Research Purpose | 5 |
| 1.5. Delimitation | 5 |
| 1.6. Contributions | 6 |
| 1.6.1 Theoretical contribution..... | 6 |
| 1.6.2 Practical contribution | 6 |
| 1.7. Structure of the paper | 6 |
| 2.0. CONCEPTUAL FRAMEWORK | 7 |
| 2.1. Disruptive Theory | 7 |
| 2.1.1. Disruptive Theory as a Business Model | 7 |
| 2.1.2. Disruptive Innovation in audit..... | 9 |
| 2.2. Artificial Intelligence as Audit Evidence | 10 |
| 2.2.1. Machine Learning | 12 |
| 2.2.2. Speech..... | 13 |
| 2.2.3. Vision | 13 |
| 2.2.4. Planning, Scheduling and Optimization | 14 |
| 2.3. Auditors' Skills and Competence | 14 |
| 2.3.1. Skills..... | 14 |
| 2.3.2. Competence | 15 |
| 2.3.3. Effect of Advanced Technology on Skills and Competencies | 15 |
| 2.4. Audit Process..... | 17 |
| 2.4.1. Planning | 17 |
| 2.4.2. Risk Assessment..... | 17 |
| 2.4.3. Audit Strategy and Plan | 18 |
| 2.4.4. Gathering of Evidence | 18 |
| 2.4.5 Finalization of the Audit..... | 18 |
| 2.4.6. Effect of Advanced Technology on Audit Process..... | 19 |
| 2.5. Audit Quality | 19 |
| 2.5.1 Effect of Advanced Technology on Audit Quality | 22 |
| 2.6 Summary and graphical model of the conceptual framework..... | 23 |

| | |
|---|----|
| 3.0. METHODOLOGY | 26 |
| 3.1. Theoretical Methodology | 26 |
| 3.1.1. Preunderstanding | 26 |
| 3.1.2. Research Philosophy | 27 |
| 3.1.3. Research Approach | 28 |
| 3.1.4. Research Method | 29 |
| 3.1.5. Research Design | 30 |
| 3.2. Practical Methodology | 31 |
| 3.2.1. Data Collection | 31 |
| 3.2.2. Sampling | 32 |
| 3.2.3. Practical Selection | 33 |
| 3.2.4. Interview Guide and Process | 34 |
| 3.2.5. Data Analysis | 36 |
| 3.2.6. Literature Search | 38 |
| 4.0. EMPIRICAL RESULT AND FINDING | 39 |
| 4.1. Background | 39 |
| 4.2. Skills and Competences | 41 |
| 4.3. Audit Process | 44 |
| 4.4. Audit quality | 45 |
| 5.0. ANALYSIS AND DISCUSSION | 48 |
| 5.1. Skills and Competences | 48 |
| 5.1.1. Skill set to perform audit using Artificial Intelligence | 48 |
| 5.1.2. Potential threats and opportunities to auditors | 49 |
| 5.1.3. Redesigning the academic curriculum | 50 |
| 5.2. Audit Process | 50 |
| 5.2.1. Contribution of AI to understanding business environment | 50 |
| 5.2.2. Risk Assessment Potentials of AI | 51 |
| 5.2.3. AI as a data gathering and audit evidence tool | 51 |
| 5.2.4. General impact of AI on audit process | 52 |
| 5.3. Audit quality | 53 |
| 5.3.1. Potential of AI to help identify risks, misstatements, and fraud | 53 |
| 5.3.2. Potential of AI in increasing reliability of audit report | 54 |
| 5.3.3. General Impact of AI on audit quality | 54 |
| 6.0. CONCLUSION | 56 |
| 6.1. General Conclusion | 56 |

| | |
|---|----|
| 6.2. Contribution and Implications..... | 57 |
| 6.2.1. Theoretical Contributions | 57 |
| 6.2.2. Practical Contributions | 58 |
| 6.2.3. Societal Implications..... | 58 |
| 6.3. Limitations..... | 58 |
| 6.4. Future Research..... | 59 |
| 6.5. Quality Criteria..... | 59 |
| 6.6. Ethical Consideration..... | 61 |
| 7. REFERENCE | 63 |
| 8. Appendix | 68 |
| 8.1. Appendix 1: Email to interview participants..... | 68 |
| 8.2. Appendix 3: Interview guide | 69 |
| 8.3. Appendix 3: Information Sheet | 70 |

List of Figures

| | |
|--|----|
| Figure 1: How to Assess Disruptive Technologies | 8 |
| Figure 2: Forms of AI | 12 |
| Figure 3: The Future of Education and Skills: OECD Education 2030 Framework... | 15 |
| Figure 4: The five phases of an audit process | 17 |
| Figure 5: Framework for audit quality | 20 |
| Figure 6: Graphic model of the conceptual framework..... | 23 |
| Figure 7: Formulating interview guide | 35 |

List of Tables

| | |
|---|----|
| Table 1: Interview details | 36 |
| Table 2: Summary background of participants | 40 |

1.0 INTRODUCTION

This chapter examines the transformation of the auditing profession, how advanced technologies are disrupting the audit process, and their impacts. We then analyze the theoretical background of the topic which makes it relevant as a mega and current trend in business administration, particularly in auditing. Further, we identify the research gap and illustrate the relevance of the study to fill the gap by constructing research questions. Finally, we outline the research purpose, delimitation, contributions, and structure of the study.

1.1. Background

The audit profession has gone through a lot of transformation over the years, it was first introduced for checking activities in ancient civilizations. However, auditing practice became known during the industrial revolution between 1800 and 1900 when auditing was about ensuring the correctness of accounts, detecting fraud, and errors. In the present day, the services of auditors are expected to provide value-added services beyond expressing an audit opinion on the financial statements (Teck-Heang & Ali, 2008, p. 1-7). According to the Association of International Chartered Certified Public Accountants (AICPA), (2012, p. 2), during these periods of auditing transformation, audit practices were not conducted independently, instead, auditors relied on information from management to formulate their audit opinions and this contributed to audit scandals. The scandals such as Enron, WorldCom, Xenon, and many other accounting and auditing practices made the news, and these had contributed to the enactment of laws and regulations. The Sarbanes-Oxley Act (SOX Act, 2002) was enacted because of accounting misconduct and auditing failures to deter misconduct and restore the confidence of investors (Hwang & Staley, 2005, p. 227-228). Carcello et al. (2005, p.118) argued that the SOX Act significantly changed the corporate governance and financial reporting systems of public companies promoting effective internal controls.

Today, there are calls for a shift from the traditional auditing techniques of sampling to the use of advanced technology with the capability to analyze all the operating activities of a business to improve audit quality (AICPA, 2012, p. 4). The Institute of Chartered Accountants in England and Wales (ICAEW), (2016, p. 5-6) states that artificial intelligence, blockchain, cyber security, cloud computing, cloud storage, and data analytics are evolving technologies transforming audit and company's business models. According to Issa et al. (2016, p. 14), there are concerns about the negative impact of advanced technology on employment with workers worried about being replaced by machines. However, they argued that these technologies can either assist or replace humans, there are some tasks such as tax preparation that can be automated to increase productivity but difficult to automate cognitive non-routine tasks. Advanced technologies can be used to automate the audit process and make it highly efficient and effective with proposed phases such as pre-planning, contracting phase, understanding internal controls, and identifying risk factors, control risk assessment, substantive testing, evaluation of evidence, and audit reporting (Issa et al., 2016, p. 12). Efficiency and reliability in audit processes will continue to increase as advanced technology is being developed and deployed by auditors (Raschke et al., 2018, p. 112). Kokina & Davenport (2017, p. 116) argued that data analytics and artificial intelligence are suitable for structured and

unstructured data to gain insight into the financial and non-financial performance of companies. Advanced technology will change the scope of audit from being reactive to proactive, allowing audit activities to be performed more effectively and efficiently. This will require some changes in the auditing standards to be able to adopt and implement these disruptive technologies (Issa et al., 2016, p. 3-9).

Innovations create both challenges and opportunities, therefore, it is important for auditors to understand the evolution of the profession to take advantage of the opportunities (Ozlanski et al., 2020, p. 77). Christensen (1997, p. 11) noted that innovation caused by disruptive technology significantly changes how an industry operates and, in most cases, a different business model often emerges, and they perform better than the existing products in the market. According to Ozlanski et al. (2020, p. 82), disruptive technology is changing how financial information is gathered, verified, and communicated.

Artificial Intelligence (hereafter AI) will disrupt the skill sets of auditors, as the current skills will become inefficient and therefore the need for training to learn various AI applications (Issa et al., 2016, p. 11). According to Chartered Professional Accountants (CPA), Canada (2020, p. 2) AI is “*the science of teaching programs and machines to complete tasks that normally require human intelligence*”. Issa et al. (2016, p. 3) define AI in audit as a hybrid set of technologies supplementing and changing audit. Albawwat & AlFrijat (2021, p. 755) stated that AI can help data to be mined and combined to offer better audit processes at various stages. AI can extract relevant information from accounting data aiding auditors to spend more time on areas that require high-level judgment and is also being used by several auditing firms to examine and summarize the entire population of inventories than conducting sampling (Kokina & Davenport, 2017, p. 117-119). This according to Issa et al. (2016, p. 10) would decrease the probability of fraudulent activities, manipulation, and misstatements of accounting information eluding the attention of auditors. AI is expected to perform complementary of many audit functions increasing the competencies and effectiveness of the assurance services provided by auditors (Issa et al., 2016, p. 5). The chief innovation officer of Deloitte, Jon Raphael states that the audit process will become smarter, more insightful, and more efficient with the effective implementation of AI technologies (Issa et al., 2016, p. 3). According to Raschke et al. (2018, p. 113), a survey conducted by the World Economic Forum in 2015 stated that 30 percent of auditing will be performed using AI by 2025. Albawwat & AlFrijat (2021, p. 756) stated that PWC expects by 2030 the continuous investment in AI will contribute 15.7 trillion dollars (about \$48,000 per person in the US) to global economic growth.

Industries are being motivated to use AI tools to save money by reducing human labor and increasing efficiency of business processes and tasks (Raschke et al., 2018, p. 111). The skills of accounting and auditing staff are likely to be affected by AI in the future regarding reduction in entry-level jobs (Kokina & Davenport, 2017, p. 119). Issa et al. (2016, p. 9) argued that auditors will be able to focus on high-value tasks instead of wasting time on repetitive tasks that can be done by AI and focus on the interpretation of results putting the professional skills of auditors to a better use.

The big four audit firms are adopting AI in their assurance services. Deloitte is making use of cognitive technology and analytics to evaluate contracts (Deloitte, 2018, n.p). KPMG has introduced KPMG Clara, an AI technology that analyzes complete population, with features to identify unusual patterns in transactions to help focus on highly risky areas given deep industry insights to audit team members (KPMG, 2018, n.p). PwC invested in audit.ai called GL.ai, an AI and machine learning to examine all uploaded transactions (users, amounts, accounts) to detect unsuspected transactions in the general ledger (PwC, 2018, n.p). EY is using AI to analyze large sets of data to identify and respond to material misstatements and to extract unstructured data like contracts, invoices, and images for further audit evidence and analysis (EY, 2019, n.p).

Financial decision-making needs to be made with a lot of data and in a short period of time, making traditional use of the human mind becoming impossible (Kokina & Davenport, 2017, p. 115). According to AICPA (2018, p. 4) audit of the future provides the use of automated tools to offer quality assurance services to clients and all stakeholders.

1.2. Problematization and Research Gap

Technology has had an enormous impact on every form of business model. It has shaped and reshaped how businesses operate and function, in most situations completely reengineering the traditional methods. Audit, like most other business models, has undergone revolutionary reinvention due to the availability of technology (Crosley & Anderson, 2018, p. 5). Businesses are now increasingly looking out for opportunities that they can leverage to increase profitability and create more added value for their shareholders, and to become more competitive and sustainable in the long term (Stancheva-Todorova, 2018, p. 126). Historically, the audit function was limited to confirming the accurateness of the financial statements as reported by management, but this function although still relevant, has increased in scope over the past decades. Teck-Heang & Ali (2018, p. 1) argue that the audit function “can be observed as a means of social control because it serves as a mechanism to monitor conduct and performance and to secure or enforce accountability”, and to be able to effectively deliver on such mandate, the profession has evolved from just ‘confirming’ financial statements accuracy into providing more value-added services like risk assessment and management.

Technological tools like AI and Machine Learning (ML) have now made it possible for huge volumes of data to be processed and analyzed within a shorter period than before. A feat the human auditor lacked the capacity to perform. In the past, auditors had to use sampling to select transactions and test their completeness and accuracy (Crosley & Anderson, 2018, p. 5). Though the concept of applying AI to auditing is not novel, it has now reached a spectrum that its neglect is tantamount to ‘suicide.’ This is because AI tools are now able to analyze large volumes of data sets and determine patterns and relationships. This has become possible because of the availability of huge data sets and almost unlimited computing power (Kokina & Davenport, 2017, p. 115).

According to Kokina & Davenport (2017, p. 115), this increasing adoption of technology in audit is being fueled by both demand and supply factors, but the major one is on the supply side. There is software and hardware that can perfectly perform cognitive and repetitive tasks. There is no better time for auditing to merge with AI than now as it is

increasingly becoming too challenging for human auditors to analyze huge volumes of structured and unstructured data in various locations to gain the relevant financial and non-financial information that they may need to form their opinions. Since most audit tasks are repetitive and structured, these tasks can be performed better by AI systems so that the human auditor will be relieved to concentrate on more unstructured processes (Kokina & Davenport, 2017, p. 116).

The big 4 audit firms (KPMG, EY, Deloitte, and PwC) have taken giant steps to incorporate AI into their audit processes. KPMG has partnered with IBM's Watson AI to develop AI audit tools (Melendez 2016, cited by Kokina & Davenport, 2017, p. 116). PricewaterhouseCoopers (PwC) has developed Halo, an analytics platform that serves as a pipeline to AI and augmented reality products (M2 Presswire 2016, cited by Kokina & Davenport, 2017, p. 116). Deloitte has developed Argus for AI and Optix for data analytics (Kokina & Davenport, 2017, p. 116).

The introduction of AI into auditing will no doubt present some opportunities and threats for auditors. Employability in the industry, skills, and competence required to perform auditing using these technologies, the audit process, and audit quality will all be impacted. Researchers have done some work to measure how AI employed in auditing will impact various sections of the industry. Bierstaker et al (2001) looked at the impact of IT on the audit process, Dyball & Seethamraju (2021) focused on the impact of blockchain technology on audit risk and approach. Siriwardane et al (2014) and Vallas (1990) have also done some excellent work on auditor skill and competence. Lombardi et al (2015) and Stancheva-Todorova (2018) have also done research on the impact of AI on employability in the audit profession. However, most of these studies have focused on the Americas and a few other Asian countries, with little or no attention paid to the Scandinavian region.

Sweden specifically is a highly technological and innovative country. According to the United Nation's World Economic Summit (2017) index of most innovative countries, Sweden ranked as the second most innovative country out of a total of 128 countries. This is evidenced in how Sweden leverages technology to provide solutions to society and businesses. The use of AI technologies to provide efficiency and quality assurance in business processes is therefore not new in Sweden. However, little is known about how the application of AI technologies is impacting the auditing profession in Sweden. In addition to the reason for choosing Sweden for our research work, Sweden is reported as a country with a high-risk premium. As of 2021, the risk premium of Sweden is 7.5 percent, making it one of the highest in comparison with other countries in Europe (Statista, 2022). Because of the high-risk premium in Sweden, investors will demand a higher return on their investments than most of their European counterparts. As Sweden's economy is heavily dependent on technology, with the high volatility and disruptive nature of technology investors become uncertain and require a higher return on investments. This might explain the high-risk premium of Sweden. Therefore, it is better to conduct the research in Sweden for the findings to serve as a model for other countries. This apparent lack of information regarding the impact of AI on the skills and competencies, audit process, and audit quality in Sweden is what our research seeks to address.

1.3. Research Question

1. What is the impact of AI on the skills and competencies of auditors?
2. What is the impact of AI on the audit process and audit quality?

1.4. Research Purpose

The purpose of this exploratory qualitative study is to assess the impact of AI on auditing in Sweden. Specifically, the study will focus on the impact of AI on auditor's skills and competencies, audit process, and audit quality. Although the big 4 audit firms are using some sort of AI technologies in the operations in Sweden, not much information is available concerning the impact of this on auditor's skills and competencies, audit process, and audit quality. This study therefore seeks to evaluate the impact that the application of AI in auditing with a specific focus on auditor's skills and competencies, audit process, and audit quality.

Regarding the skills and competencies of auditors, the study will find out the relevant skills and competencies required for auditors to function effectively in an AI environment. This will be necessary because the current academic curriculum focuses more on teaching theoretical accounting and auditing-related issues, without any avenue for auditors and prospective auditors to gain knowledge in the application of AI tools. If auditing will be impacted by AI, then there is need to investigate the skills and competencies required to function in such an environment. The study will therefore seek to find out if auditors need some other forms of skills to be able to perform optimally in an AI environment or if what the current curriculum offers is adequate to meet the current demands of the profession. The study will also find out if there is a need to change the academic curriculum, to include the relevant skills in training the next generation of auditors.

For the audit process, the study will help to better understand the contribution of AI in audit planning, risk assessment, and gathering of evidence in conducting audits. The study will also be helpful in how AI is contributing to aiding auditors to understand the business environment of their clients and how it has contributed to strengthening the internal controls. This is particularly important to investigate because the auditor will offer an opinion based on the data provided and the evidence gathered.

Regarding audit quality, the study will be useful in assessing how AI has contributed to the quality of audit reports. That is how it has helped in risk identification, detection of misstatement and fraud, and the reliability of audit reports. Stakeholders of businesses are genuinely concerned about the quality of audit reports, and if technology has the potential to improve the quality of audit reports, this will be a welcomed addition. This study will seek to find out if indeed AI technologies have the potential to improve audit quality or not.

1.5. Delimitation

The findings of this research will be limited to some factors. First, the study focuses on the big four audit firms operating in Sweden. This means the findings may only be relevant within Sweden, and these findings may change when conducted in a different geographical setting. Sweden was selected for this study because it is technologically advanced with the big 4 audit firms using one form of AI in their operations. The research does not include small to medium-tier audit firms because initial investigation and inquiries made by the researchers revealed that most of the non-big four firms have not

started using AI in their audit work. Therefore, for in-depth theoretical and practical contributions, the researchers used participants from the big four firms. It is also an established fact that the non-big four firms always look up to the big four firms to take the lead in adopting major technological and policy changes for them to follow. Therefore, the result of the findings would be useful and serve as a guide to non-big firms. This study uses the qualitative methodological approach and the perceptions of respondents, knowledge, experience, etc., will go a long way to shape the conclusions that may be arrived at. It is possible when such perceptions, knowledge, and experiences change over time, the conclusions will not be valid as they will be at the time the study was conducted. Additionally, this study is concerned with a topic that is new and immature in the field. The authors, therefore, concede that there may be challenges with having access to more detailed scientific papers to rely on.

1.6. Contributions

1.6.1 Theoretical contribution

This study will make meaningful contributions to the growing body of literature about how AI will impact the auditing profession. The study will magnify the impact that AI will have on the audit profession, the required skills, and competencies that auditors must possess, how the audit process will be impacted by AI, and audit quality in an AI audit environment. The study will present the Sweden perspective of these, and this will contribute, and enrich the literature in this growing field.

1.6.2 Practical contribution

This study will have practical implications for auditing professionals, management of audit firms, and academic institutions. Auditing professionals will have an idea about the type of employment opportunities that will exist in the sector, the skill sets and competencies which will be required to take advantage of these opportunities, and how they can continue to add value to their work. Management of audit firms will become aware of the trends in the industry, the type of training programs they must arrange for their staff, and how to help them to strategize better to acquire the relevant technologies which will deliver added value to their services. Educational and academic institutions will become acquainted with the relevant skills that are necessary for the present-day auditor to become more efficient. In this way, curriculum can be structured with this objective in mind.

1.7. Structure of the paper

Chapter one of this study will be the introduction. The introduction will be made up of the following: the background to the paper, the problematization and research gap, the research question, the purpose of the research, delimitations of the research, contributions of the research and the structure of the paper. Chapter two will be the conceptual framework. This section will delve into the theory supporting the research and other concepts related to the research questions. Chapter three will discuss the philosophical underpinning of the research and the methodology selected to answer the research question. Chapter four will contain the details of the empirical data collected through interviews. Chapter five will contain the analysis and discussion of the empirical data collected. Chapter six will conclude with the main findings of the research, its implications, and limitations, and areas for further research in the future.

2.0. CONCEPTUAL FRAMEWORK

This chapter discusses the conceptual framework of the research topic. The researchers discussed disruptive theory as a business model and its impact on the audit profession. This was followed by discussing Artificial intelligence (AI) as a concept of disruptive technology in auditing and its usefulness in gathering audit evidence. Lastly, the researchers discussed the theories on the various parameters of the research questions (skills and competencies, audit process, and audit quality) and how Advanced technologies are shaping and impacting the chosen parameters.

2.1. Disruptive Theory

2.1.1. Disruptive Theory as a Business Model

The business environment has become very fluid, and to be able to maintain competitiveness in the operational environment, businesses must make strategic decisions and choices. Businesses exist to create value for their customers, and the processes involved in this value creation are referred to as the ‘business model.’ The model of a business is not exempt from influences, either internally or externally. A disruption occurs when there is a drastic change to the firm's value creation mechanism which has the impact of affecting how value is created for the customers, how the business operates, or both, and will with time affect the established market (Habtay, 2012, p. 291).

Christensen & Bowler (1995) proposed the theory of innovation disruption and described how it affects businesses in their work ‘Disruptive Technologies: Catching the wave’. According to Christensen and Bowler (1995, p. 45), many businesses, when they gain a stronghold in an industry, often tend to ignore technologies that do not seem to add value to meet the needs of their current customers. New businesses that pursue innovative technologies can spring up and dethrone these established businesses.

Christensen & Bowler (1995, p. 44) argue that companies that usually do stay ahead of their industries invest in incremental and other times radical innovative approaches to be able to meet the next generational needs of their customers. This apparent disinterest in potentially disruptive technologies by established businesses leaves room for new businesses to target and grow a niche market within the industry. Christensen & Bowler (1995, p.45) further argue that potentially disruptive technologies often perform far worse on some indicators than what mainstream customers are used to. This makes them undesirable. Businesses will not want to offer such products to the customers. Disruptive technologies because of their undesirability by mainstream customers will have to be marketed to new markets and customers. This point is emphasized by Habtay (2012, p. 293) who affirms that disruptive technologies begin with inferior technology. While some do fail, others are able to progress to a period where they cause disruption after extended periods of experimentation and adaptation.

The potential of innovative technology to cause disruption will depend on its ability to draw customers from the traditional market. Christensen & Bowler (1995, p. 45) refer to this as the ‘performance trajectory’ of the technology. They argue that for innovative technology to cause disruption in the market, the performance trajectory must keep on rising till it intersects with the performance demands of the mainstream customers. At

this point, the mainstream customers will be drawn to innovative technology, thereby causing a disruption in the market.

How to Assess Disruptive Technologies

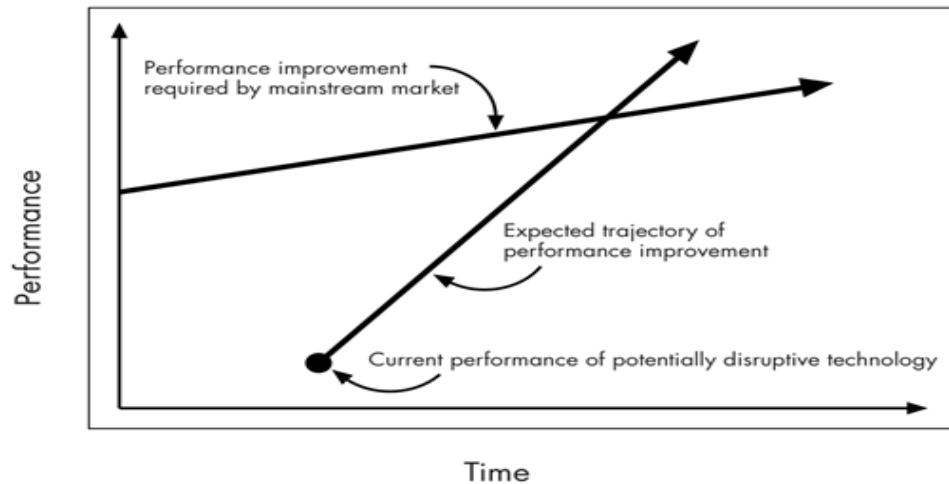


Figure 1: How to Assess Disruptive Technologies

Source: Christensen & Bowler (1995, p. 49)

In the figure above, Christensen & Bowler (1995) summarize the trajectory of disruptive technologies. They explain that disruptive technologies often begin as low performing technologies, and do not meet the current performance requirements of the mainstream market, but with time, once the expected trajectory performance keeps rising faster than the performance required by the mainstream market, the innovative technology will cause a disruption, and attract the mainstream customers.

Christensen & Bower (1995, p. 47) further argue that the propensity for a disruptive technology to be accepted or rejected will depend on the business's revenue and cost structure. Because businesses have established customers whom they are able to generate a good amount of revenue, managers often are not willing to invest in disruptive technologies which may not guarantee any revenues. Moreover, investments in disruptive technologies are expensive and huge, and will often require shifting of resources from revenue-generating activities. Because of this, managers may reject investing in disruptive technologies because it will reduce their revenue streams and increase their cost streams. Christensen & Bower (1995, p. 48) stress that managers may not adopt disruptive technologies because

“Managers are evaluated on their ability to place the right bets, it is not surprising that in well-managed companies, mid and top-level managers back projects in which the market seems assured. By staying close to lead customers, as they have been trained to do, managers focus resources on fulfilling the requirements of those reliable customers that can be served profitably. Risk is reduced - and careers are safeguarded by giving known customers what they want.”

Christensen & Bowler (1995, pp. 49 - 53) further developed five typologies for identifying disruptive technology, the first is to determine whether the technology is disruptive or sustaining. They noted that observance must be made by managers and technical personnel. If there are disagreements about technology, it will be disruptive technology. Top-level management may oppose such technology because of the financial commitments with no guarantee of revenue streams, while technical personnel will argue that markets will emerge for such disruptive technologies. The second is to define the strategic significance of disruptive technology. This is about determining the customer demand performance and the performance trajectory of disruptive technology. If the performance trajectory of the disruptive technology is likely to rise at a faster speed compared to the performance demand of customers, then it is a strategic disruptive technology and must be considered. Thirdly is to locate the initial market for disruptive technology. Since disruptive technologies are usually not patronized by established customers, the business will have to start aggressive marketing and identify a smaller niche market that will accept the product. The fourth typology is to place responsibility for building a disruptive technology business in an independent organization. The responsibility for building the new disruptive technology should be vested in an independent organization. This helps to reduce conflicts and allows innovative technology to develop and be tested until the right performance trajectory is achieved. Lastly, keep the disruptive organization independent. Managers of the new disruptive technology must be given free room to operate and grow the product.

“The key is to manage strategically important disruptive technologies in an organizational context where small orders create energy, where fast low-cost forays into ill-defined markets are possible, and where overhead is low enough to permit profit even in emerging markets” (Christensen & Bowler, 1995, p. 53)

2.1.2. Disruptive Innovation in audit

Businesses are rapidly changing their processes and modes of operations to be able to meet the current demands of their customers. Auditors need to understand the client's business strategy and processes used in delivering value. Process auditing is very key to the successful completion of any audit, and advanced technology has now made it simpler and automated, leaving auditors to focus more on other aspects of the audit (Bierstaker et al., 2001, p. 160).

Traditionally, auditors have had to rely on documentary evidence in paper form like receipts, payment vouchers, cheque duplicates, etc. to gather the relevant audit evidence before they could form an audit opinion. This traditional method is however giving way to paperless methods of auditing where technology has made it possible for auditors to have access to every documentary evidence needed electronically and in real-time, thereby increasing efficiency and accuracy. Bierstaker et al (2001, p. 159) argue that this disruption of the traditional method to the paperless system has become possible because of the enhanced and efficient storage capacity of modern technological devices. This assertion is supported by the work of Christensen & Bowler (1995) in which they argue that disruption technologies in their preliminary stages usually perform at a lesser level than the current technologies at the time, but if their performance trajectory rises faster than the customer performance demands, it will deliver higher and better performance in

the future and customers will naturally be drawn to them, thereby causing a disruption of the older technology.

Furthermore, huge volumes of data needed to be processed and analyzed by the auditor before they could form an audit opinion. This task was economically not viable in its entirety, so auditors must resolve to select a sample of transactions to test and verify their accuracy and completeness. The challenge with this system is that there is a higher chance of missing potentially risky transactions. Technology has now made it possible for auditors to process and analyze all data without the need to sample. This can be done in noticeably short periods with specialized technology like artificial intelligence. The possibility of missing potentially risky transactions is eliminated (Crosley & Anderson, 2018, p. 5).

2.2. Artificial Intelligence as Audit Evidence

Artificial Intelligence (AI) works by applying the computational power of the computer to big data, to identify patterns and possibilities (Crosley & Anderson, 2018, p. 5). Ergen (2019, p. 5) also explains AI as “*the ability for a machine to perform cognitive functions, such as perceiving, reasoning, learning and interacting*”. For a machine to be able to achieve this feat, certain technology needs to develop to a mature level, especially on three key components, namely, computational power, huge volumes of data, and advancement in algorithms (Ergen, 2019, p. 5). This is consistent with the Disruption Innovation Theory proposed by Christensen & Bowler (1995) to the effect that disruptive technologies set out as inferior technologies to the needs and demands of the present situation. But if its performance trajectory keeps rising faster than the performance demands of the current technology, then it will only be a matter of time before it disrupts the present technology and leads it into extinction. Although the concept of AI has been around since the 1950’s it had been limited because the three components needed for its better implementation were not mature enough. With the introduction of personal computers from the 1980s, these three technological elements had seen so much improvement that they made AI functionality possible (Ergen, 2019, p. 5).

This makes it possible to automatically convert information into several distinct categories to enhance analysis and provide meaning.

“Accounting-based AI can analyze and draw conclusions while identifying notable outlier transactions that require closer review. For example, in the past, reviewing many lease contracts to ensure that they were properly booked required a small army of auditors holed up for weeks in a back room. Now, thanks to AI, a computer can read, evaluate, assess, and draw conclusions on a pile of contracts within a few hours, reliably flagging potential problems and inaccuracies for further review” (Crosley & Anderson, 2018, p. 5).

The primary responsibility of auditors is to express their opinion on the financial and non-financial records of an entity. This is achieved by examining the records underlying the facts in the statements and gathering enough evidence on which they can base their opinion. According to the Public Company Auditing Oversight Board (PCAOB) Auditing Standard 15 (2010),

“Audit evidence is all the information, whether obtained from audit procedures or other sources that are used by the auditor in arriving at the conclusions on which the

auditor's opinion is based. Audit evidence consists of both information that supports and corroborates management's assertions regarding financial statements or internal control over financial reporting and information that contradicts such assertions."

Though the extent of evidence required to be able to form an informed opinion is not explicitly stated, the standard prescribed by the PCAOB explains what can be construed as 'sufficient appropriate audit evidence.' Sufficiency is a measure of the quantity of audit evidence needed for the auditor to be able to form an informed opinion on the financial statement.

Traditionally, auditors were not able to examine all the underlying transactions because of the volume of data and its associated cost. Auditors, therefore, relied on sampling and some portions of the data and testing it to extract evidence to support their opinion. This increased the risk of misstatements and faulty opinions. The emergence of modern technological tools has now made it possible for auditors to test the entirety of the data underlying the financial statements (Brown-Liburd & Vasarhelyi, 2015, p. 2). Artificial Intelligence therefore as a tool in auditing can be used by the auditor to gather 'sufficient' information which can be used as audit evidence with the assurance that the entire data has been tested.

Another aspect of 'sufficient appropriate audit evidence' which the PCAOB explains is the relevance and reliability of the information. Whereas relevance relates to the relationship between the assertion and its objective, reliability relates to how much premium can be placed on the evidence (PCAOB, AS 15, 2010). Brown-Liburd & Vasarhelyi (2015, p. 7) although agree that technology will present new opportunities which hitherto were not available to auditors in gathering relevant and reliable data, care must be considered when using technology to gather evidence. Appelbaum (2016, p. 19) also cautions "*with more than 90 percent of these records in easily alterable digital formats that possess many iterations and possibilities, provenance of data sources and provenance of log files become of paramount importance*" to the auditor who relies on these data sources to gather sufficient appropriate audit evidence.

AI can be manifested in several forms. In fact, AI is now embedded in a lot of our everyday activities and devices. Machine learning (the ability of machines to exhibit intelligence without programming), speech and natural language processing, robotics, expert systems, etc., are all forms of AI (Vijayakumar & Sheshadri, 2019, p. 137).

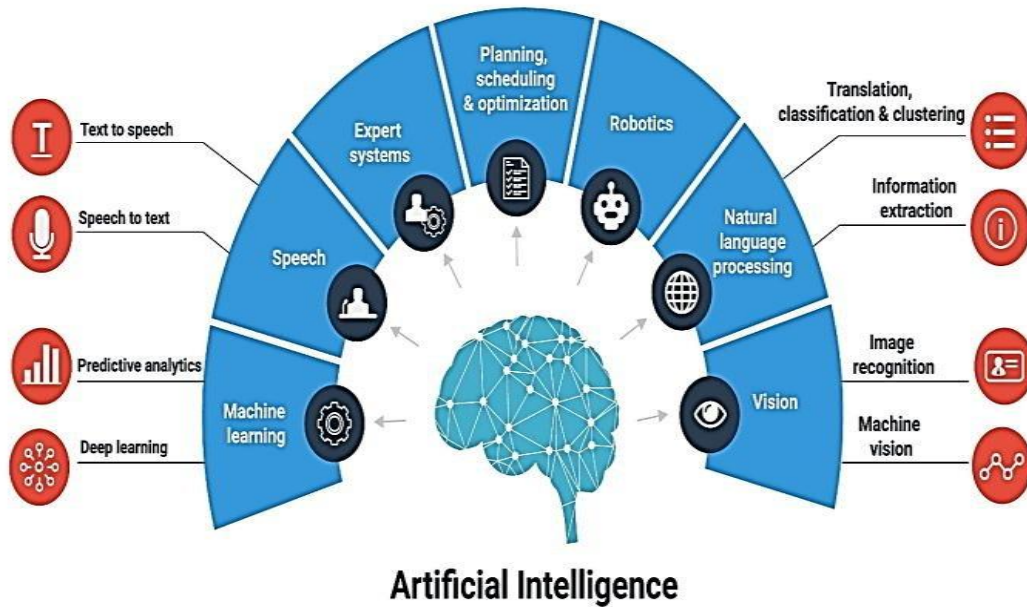


Figure 2: Forms of AI

Source: (Vijayakumar & Sheshadri, 2019, p. 137)

2.2.1. Machine Learning

Machine learning is an aspect of AI which has is receiving huge patronage in industry. Machine learning involves training machines to be able to perform certain functions automatically. Huge volumes of data are used in this process. The machine then can acquire a ‘mind’ of its own, and it is able to process data which it has not been exposed to prior.

Deep learning and predictive analytics are examples of machine learning. According to Najafabadi et al (2015, p. 1), “deep learning algorithms extract high-level, complex abstractions as data representations through a hierarchical learning process”. This is achieved by training algorithms with vast volumes of data, thereby making it possible for the algorithms to ‘learn’ the patterns and enable the analysis and extraction of data. This has become useful to auditors as it allows them to process vast volumes of data easily and extract the relevant information with almost perfect accuracy. This is because most data provided by clients are either unstructured or semi-structured and getting such data into meaningful and structured formation is mostly impossible for the auditor due to time and other resource constraints. A deep learning system, therefore, allows auditors to automate many tasks that have traditionally been conducted manually, such as checking inventories, processing paperwork, reviewing contracts, and even drafting audit reports (Sun & Vasarhelyi, 2017, p. 26).

Predictive analytics involves using advanced data analysis techniques to make predictions—based on probabilities—about the future. (Forbes Insights, 2021, p. 3) Auditors can use this technology to extract data from the client’s business, iterate it with industry and market data, to get a better understanding of the client’s business environment, identify potential and actual risks, and adopt strategies that can address such issues. This, therefore, gives the auditor a clearer picture of the situation of the client's business, and which areas they need to focus much on. Benchmarking the performance

of the client's business with industry and market standards has the potential to identify risks, especially those not easily perceived by the client. Fraud, errors, and misstatements are also greatly reduced since outlier transactions and issues are easily flagged for further investigation.

2.2.2. Speech

Speech recognition systems are now one of the most common forms of AI in use. It is now possible to control a lot of devices with speech. For example, Apple's Siri can be used to control mobile phones, laptops, and other devices through speech recognition technology. Samsung's Bixby can control your television with voice prompts. Laptops now have speech recognition technology that enables speech to be translated into text immediately.

Speech recognition systems have become very pivotal for modern auditors. These systems can convert speech to text and vice versa. Speech-to-text systems enable the auditor to accurately translate audio speeches into text formats for further investigation. This becomes immensely helpful when interviewing client staff to gain practical insight into the operations of the business. Traditionally, such an interview will be recorded and transcribed, before converting such into other forms of data for analysis. This process is time-consuming because it could take several days to complete.

Text-to-speech systems have become unbelievably valuable tools for auditors, especially when reviewing huge volumes of data. Reading and reviewing contracts, leases, agreements, etc. can be particularly challenging. These systems can translate text into speech which can be listened to at any point in time. Traditionally, a lot of files and data had to be carried around from one point to another, which posed a lot of risk to the integrity of the data and the person carrying it.

The advantage of these systems is that they give auditors opportunities to convert data easily and quickly from either text to speech or speech to text for analysis and decision making. (Vijayakumar & Sheshadri, 2019, p. 137)

2.2.3. Vision

Vision enhancing technology is common and has been used in certain industries for a while now. In the military, these technologies are used to enable soldiers to have a better view of their environments and targets. Pilots, drivers, photographers, and many more are leveraging on these technologies to deliver quality and efficient services. Examples of vision enhancing technologies are night vision goggles, smart lenses, drones, and smart eye contacts.

Vision enhancing AI systems are fast becoming some of the tools modern auditors are employing to improve the efficiency and effectiveness of their audits. Smart lenses have the capability to identify keywords, phrases, terminologies, etc., which make document review and analysis easier and less time-consuming. Additionally, some smart lenses can scan and transfer files, making document sharing between team members easier and faster.

Auditors are also making use of drones to reach remote areas to conduct audit investigations. This becomes very necessary when they must count vast numbers of inventories or track goods in transit. Drones with specialized features can hover, scan,

and calculate the quantity of inventories available. This will then be compared with the data supplied by the client and any discrepancy can then be investigated. (Vijayakumar & Sheshadri, 2019, p. 137)

2.2.4. Planning, Scheduling and Optimization

Planning and scheduling of resources is one key functions of every organization without which the organization cannot operate at an optimal level. Identifying the needs and requirements necessary to achieve the required performance and output can be the dealbreaker in the successful completion of a project. For an organization with several employees spanning various departments, selecting members for a team can be extremely difficult.

Planning and scheduling resources in multinational audit firms is a daunting task. AI systems are however able to manage planning and scheduling of resources to achieve optimal usage at any point in time. The system can identify the specific skill sets required to execute a task, identify personnel with such skills, make appointments, schedule meetings, and provide in real-time update of work completed and outstanding. This frees up valuable time for auditors to focus on the real audit work.

2.3. Auditors' Skills and Competence

2.3.1. Skills

Skills are important for individuals to perform their daily tasks. Skill is the acquired knowledge that helps to execute an action to arrive at the expected result within a period with a given resource (Wikipedia as of February 2022). Every profession requires a specific skill set to accomplish assigned tasks. However, as the world evolves and in this era of advanced technology, business activities are being influenced, the skills set that are required by various professions are also changing.

Earlier researchers made some contributions to the skills set required of accountants and auditors. Palmer et al., (2004, p. 895) identified eight skills namely, communication skills, interpersonal skills, general business knowledge, accounting knowledge, computer skills, problem-solving, good attitudes and capabilities, and information technology skills. Later, a study conducted by Sirewardene et al., (2014, p. 196-198) classified the skills into ten, which are professional integrity, professional skepticism, negotiation skills, ability to understand client's business, risk assessment skills, internal control knowledge, forensic accounting knowledge, fraud detection skills, decision-making skills, and project management skills.

But in recent times, a study conducted by KPMG in partnership with Forbes identifies five essential skills. These skills are communication skills, and it is defined as the ability of auditors to clearly articulate their opinion on issues for understanding of the client and other stakeholders. It is considered the top skill of an auditor. The second skill is emotional intelligence, auditors must keep their composure and conduct accurate and comprehensive audits even if the financial record of the client is disorganized and might contain fraud or misstatement. The third skill is critical thinking and business acumen, this is about asking the right questions by having good knowledge of the client business. It has an objective analysis of all information and facts available to conduct a quality audit. The fourth skill is professional skepticism, it is concerned with recognizing and overcoming bias in making judgments and being able to ask questions in more objective

and constructive ways. The fifth and final skill is interpersonal skills, which are regarded as people skills and ability to listen to the client to understand them better (Forbes insights/ KPMG Report, 2018, n.p)

2.3.2. Competence

The concept of competence was first introduced by White in 1959 into the scientific discussion of motivational concepts (Schneider, 2019, p. 1938). According to White (1959, p. 297) competence is the capacity of an organism to interact effectively with its environment. The International Federation of Accountants (IFAC) (1998, p. 1) defines competency as the ability of accountants and auditors to perform assigned tasks and roles to an acceptable standard. The Association of Chartered Certified Accountants (ACCA) defines competency as technical knowledge and measurable skills gained by accountants and auditors by combining exams, experience, and ethics (termed the 3E's) (ACCA, n.d).

According to the Organization of Economic Co-operation and Development (OECD) (2018, p. 5) competence is more than the acquisition of knowledge and skills, it involves a combination of knowledge, skills, attitudes, and values. They classified the knowledge into disciplinary, interdisciplinary, and practical. The skills required in their view are broad but should include cognitive and meta-cognitive, social and emotional, and physical and practical skills. The attitudes and values are classified into personal, local, social, and global levels with examples as respect for life, human dignity, and respect for our environment. OCED came out with a framework as illustrated in figure 2 below.



Figure 3: The Future of Education and Skills: OECD Education 2030 Framework

Source: OECD (2018, p. 4)

The framework shows the interconnecting and interacting of knowledge, skills, attitudes, and values to produce competencies. This means that a broad range of knowledge and skills are required, it will be supported by good attitude and value practices to achieve high-level performance in an organization.

2.3.3. Effect of Advanced Technology on Skills and Competencies

Advanced technology is impacting the skills and competencies of auditors as it continues to disrupt how audits are conducted. According to Issa et al. (2016, p. 14), there are concerns about the negative impact of advanced technology on employment with workers worried about being replaced by machines. AI will disrupt the skill sets of auditors, as the current skills will become inefficient and therefore the need for training to learn various

AI applications (Issa et al., 2016, p. 11). The skills of accounting and auditing staff are likely to be affected by AI in the future regarding reduction in entry-level jobs (Kokina & Davenport, 2017, p. 119). This will therefore require human auditors to acquire skills and competencies that are beyond these advanced technologies.

According to the Institute for the Future (2011, p. 13) for auditors to remain relevant and to avoid job losses, they should focus on acquiring skills and competencies such as innovation, critical thinking, insight, analysis, and judgment. The institute came out with ten skills and competencies that are required in this era of advanced technology and these are sense-making, social intelligence, novel and adaptive thinking, cross-cultural competency, computation thinking, new-media literacy, transdisciplinary, design mindset, cognitive load management, and virtual collaboration. Sense-making is about having deeper and unique insights that are critical for decision-making. These are skills that cannot be coded and therefore skill workers can take advantage of and remain relevant. Social intelligence is the ability to connect to people. In this way, employees can assess the emotion of people and respond accordingly. This is important as there is the need to collaborate and build relations in the performance of daily tasks. Novel and Adaptive thinking is the ability to think and respond to unexpected circumstances. Cross-cultural competency is the ability to operate in diverse cultural environments with the skills of linguistics. Computational thinking is the ability to transform a lot of data into meaningful information. New-media literacy is the use of media for effective communication. That is the ability to use media tools for presentations to persuade people. Transdisciplinary is the ability to understand concepts in many fields. A worker therefore should be capable of understanding issues in various fields and offering suggestions for solving them. Design mindset refers to the ability of a worker to assess tasks assigned and adjust the processes required to arrive at an appropriate outcome. Virtual collaboration is the ability to be productive and work effectively even when physically separated (The Institute for the Future, 2011, p. 8-12).

According to Palmer et al. (2004, p. 891) to measure the competence of auditors three main components must be assessed, examining current professional practice, identifying responsibilities related to the professional practice, and identifying the knowledge and skills required to meet the responsibilities. As the accounting and auditing profession is changing, some skills and competencies are now becoming more relevant than knowledge in the curriculum of accounting and auditing education. It is therefore important for collaboration between academia and practitioners to develop a suitable curriculum to train the next generation of auditors (Palmer et al., 2004, p. 895).

2.4. Audit Process

Auditing involves a systematic process of gathering information on the activities and operations of a company and communicating the results to all interested parties. This means that the audit process should be well planned to obtain the relevant evidence (Messier et al., 2008, p.11-12). PwC categorizes the audit process into five phases as illustrated in figure 2 below,



Figure 4: The five phases of an audit process

Source: PwC (2013, p. 8)

2.4.1. Planning

This is the initial stage in the audit process. It includes several activities such as acceptance of the engagement letter from the client, verifying compliance with issues concerning independence, formation of the audit team, and finally determining the nature, timing, and procedures necessary in conducting the audit (PwC, 2013, p. 8; Sayana, 2002, p. 22).

Messier et al. (2008, p. 146) identified five stages for effective audit planning as client acceptance and continuance, establishing an understanding with the client, conducting preliminary engagement activities, assessing risks and establishing materiality, and finally planning the audit. Client acceptance and continuance required the audit firm to make background checks on the client concerning the integrity of management, internal controls matter, issues on fraud, and illegal acts. This information is to be collected from the outgoing auditor of the client. Establishing an understanding with the client involves agreeing on the terms of the engagement specifying the objectives of the audit, responsibilities of management, and the audit firm. This is important to reduce the risk of misinterpretation of the roles of either party. Conducting preliminary engagement activities involves determining the requirement of the audit and assessing the compliance requirement (ethical and independent) of the composed team (Messier et al., 2008, p. 146-153).

2.4.2. Risk Assessment

This stage involves the assessment of the client's business, industry, and environment to identify and assess risks that could lead to material misstatements in the financial statements. This requires the auditor to have a deeper knowledge of all the various players in the client's industry including competitors, customers, suppliers, and regulators (PwC, 2013, p. 8). As the business environment is evolving and becoming complex, it poses business risks, it is important for auditors to continue to have a better understanding of the client's environment throughout the audit process (Messier et al., 2008, p. 75). The risk assessment procedures include inquiries of management and people in the company,

analytical procedures, and observation and inspection. The inquiry of management and different stakeholder groups within the company is necessary to give different perspectives of the client company and its business activities. The analytical procedures help auditors to identify unexpected transactions, ratios, and trends that might be an indication of material misstatements in the financial statement. Observation and inspection involve procedures such as observations of operations of the company, inspection of documents, tracing transactions to source documents among others to understanding of operational and business practices in place at the client company (Messier et al., 2008, p. 79-80).

2.4.3. Audit Strategy and Plan

This is the next stage in the audit process after risk assessment. It involves drawing detailed plans and strategies to address the material misstatements identified at the risk assessment level. Activities at this stage include allocating tasks among the audit team members, drafting a detailed timetable on conducting the audit, among others (PwC, 2013, p. 8). This includes activities such as nature, timing, and extent of risk assessment and audit procedures to be performed to conduct an effective and efficient audit (Messier et al., 2008, p. 155). According to PwC (2013, p. 8) audit strategy and planning is a continuous process and should be conducted throughout the auditing period to address newly identified risks.

2.4.4. Gathering of Evidence

At this stage, the auditors test the internal controls of the client business, tracing the amount and disclosures in the financial statement and obtaining confirmation from third parties on accuracy and completeness of amounts in the client's books (PwC, 2013, p. 8). According to Messier et al. (2008, p. 192) it is important to test the internal controls of the client company for three reasons, the reliability of the financial statements, effectiveness, and efficiency of the operations, and compliance with laws and regulations. PwC (2013, p.8) argued that testing the controls is crucial to assess if the controls can mitigate the risk of material misstatements in the financial statements. Evidence gathering also involves performing substantive procedures which include substantive analytical procedures and tests of details (Messier et al., 2008, p. 198). PwC (2013, p. 9) noted that in addition to testing the internal controls, auditors are to perform substantive procedures for gathering more evidence.

2.4.5 Finalization of the Audit

The final stage of the audit process is where the auditors express their opinion based on their professional judgment regarding the tests conducted and evidence gathered (PwC, 2013, p. 9). Auditors are required to submit two reports to the management, namely management letters and audit reports. The management letters communicate to management all internal control weaknesses identified and suggest improvements while the audit report expresses the auditor's opinion on whether the financial statements were prepared in accordance with all applicable laws and regulations (Messier et al., 2008, p. 596-597; Sayana, 2002, p.22).

2.4.6. Effect of Advanced Technology on Audit Process

Technology is impacting on the approach and conduct of audits. According to Bierstaker et al. (2001, p. 159) technology is transforming the audit process by removing traditional audit files which rely on paper documentation and working papers.

Auditing with the help of technology is providing auditors with a lot of time away from repetitive work to focus on understanding the client's business and assessing the risks of the business and industry (Bierstaker et al., 2001, p. 159; Kokina & Davenport, 2017, p. 117). AI optimizes the time available to auditors to help analyze broad and deeper transactions to help understand better the client's business to increase audit efficiency and quality (Kokina & Davenport, 2017, p. 119; Adiloglu & Gungor, 2019, p. 209).

Technologies are helping to identify internal control strengths and weaknesses in the client's business for effective audit planning (Bierstaker et al., 2001, p. 160). According to Adiloglu & Gungor (2019, p. 209) big data and analytics enable auditors to gather high-quality audit evidence, good business knowledge, and operational risk to provide quality audits. Auditors are using smart glasses to observe and count inventory without physically present at the client's premises, which is an effective and efficient way of evidence gathering, increasing accuracy, and reducing the cost of auditing (Forbes Insight: KPMG, 2021, p.22).

Advanced technology has the potential to trace all individual transactions from the beginning to the end at much faster speeds than human auditors (Bierstaker et al., 2001, p. 161). This also makes it possible to examine the entire population of accounting transactions (Kokina & Davenport, 2017, p. 119) and improved chance of detecting misstatement and frauds (Adiloglu & Gungor 2019, p. 209)

2.5. Audit Quality

Audited financial statements are important to so many stakeholders. Shareholders and owners use it as a measure of performance of management, the government and regulatory bodies are interested to determine if the right taxes have been paid and the operations of the company are following laws and regulations, and investors are interested in the performance and prospects of the company to make investment decisions. With a lot of interest in the work of auditors as serving as external control and independent assurance (Knechel, 2016, p. 215; IFAC, n.d), the quality of audit cannot be compromised. Over the years there have been two main complaints about the work of auditors, charging high fees and low-quality audit reports. Knechel (2016, p. 215) argued that reducing audit fees is likely to reduce audit quality, and vice versa, increasing the quality of audit will also result in high audit costs. Francis (2011, p. 127) stated that audit quality is equally important to auditors as audit failures resulting from poor audit work could lead to sanctions and lawsuits from regulators and users respectively.

Audit quality has been defined by DeAngelo (1981, p.186) as the ability of auditors to discover accounting and regulatory breaches and report the breaches for the attention of all stakeholders. Knechel (2016, p. 215) went on to define audit quality to comprise two attributes of the auditor as competence (expertise) and independence (objectivity). This means that audit quality depends on the skills and competencies of the audit team and how objective the team is in conducting the audit process. It is therefore important for the audit team members to be independent in their composition and conduct of the audit,

highly skilled and competent to gather the relevant evidence (PwC, 2013, p.8; IAASB, 2014, p. 4). Knechel (2016, p. 217) argues that unique combinations of independence and competence will give some level of assurance to stakeholders on the quality of the audit report. The International Auditing and Assurance Standard Board (IAASB) develops a quality framework to create awareness of the key elements of audit quality, these elements are to serve as guidance to practitioners and they include inputs, processes, outputs, key interactions within financial reporting, and contextual factors (IAASB, 2014, p. 5). The framework is illustrated in figure 3 below and followed by an explanation of the various elements.

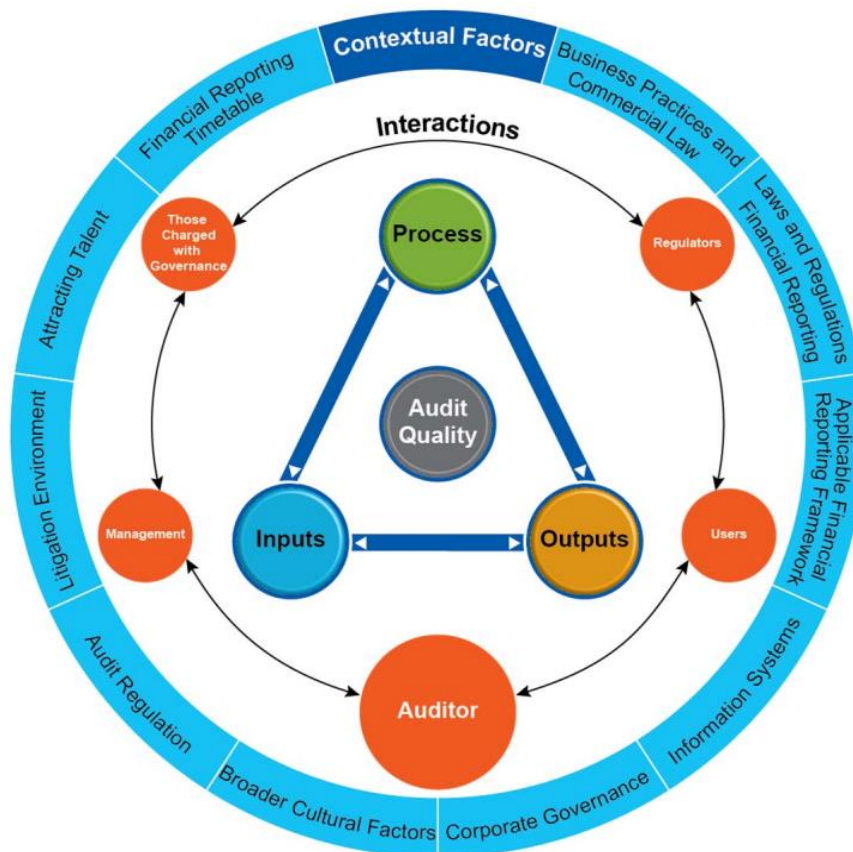


Figure 5: Framework for audit quality

Source: IAASB (2014, p. 5)

The first element is input factors, and it requires auditors to demonstrate appropriate values, ethics, and attitudes, have sufficient knowledge, skills, and experience, and sufficient time to conduct audit works (IAASB, 2014, p. 8;). Audit quality is high when competent auditors undertake audit (Francis, 2011, p. 134; Martins, 2013, p. 19), therefore it is the responsibility of auditors, the engagement team, the audit firm, and national auditing regulatory bodies to influence and ensure audit quality at all levels (IAASB, 2014, p. 8). The independence of the auditor improves audit quality (Knechel 2016, p. 216) and it is necessary for the engagement team to demonstrate professional competence, professional skepticism, objectivity, and integrity (IAASB, 2014, p. 8). The audit firm must demonstrate and create an environment of a culture that values audit quality with the existence of a good corporate governance system and training programs to safeguard independence (IAASB, 2014, p. 9). Audit quality depends on the quality, reliability, and

relevance of evidence gathered (Francis, 2011, p. 135) and this can be achieved when auditors demonstrate considerable competencies (knowledge, skills, and experience) within adequate time (IAASB, 2014, p. 10).

Process factors being the second element require the use of a robust audit process and quality control procedures that are in compliance with laws, regulations, and standards to achieve audit quality (IAASB, 2014, p. 12). These are the audit planning and evidence gathering decisions and judgments of auditors to support audit report (Francis, 2011, p. 137). Audit processes need to be conducted in accordance with well-established and laid down procedures to be able to undertake risk assessments of the client's business, plan the audit, and perform audit procedures (IAASB, 2014, p. 12; Francis, 2011, p. 137). The audit methodology guides the audit team to apply their professional skepticism and exercise their professional judgment and help in supervising and reviewing the audit work. (IAASB, 2014, p. 12; Martin, 2013, p. 19). Martin (2013, p. 19) argues that to improve audit quality, quality assessment and monitoring should be a continuous process and in real time during the audit process but to identify the issues after they occur.

The output factors convey to stakeholders the audit opinion of auditors. Stakeholders have different needs for the audit report; therefore, the report must be useful and presented at the appropriate time. The output factors can generally be classified into two, auditor's report and management report. The auditor's report provides users and stakeholders with a true and fair view of the financial statements, and this gives assurance of the quality of audit work conducted (IAASB, 2014, p. 14; Francis, 2011, p.143). The auditor's report provides users with confidence to rely on the audited financial statements in decision-making, especially in investment decisions. The management report communicates to management on issues of internal controls weaknesses and strengths identified during the audit. The management report and the engagement with management to address these internal control issues contribute to the audit quality (IAASB, 2014, 16; Francis, 2011, p. 143).

Interactions between auditors and key stakeholders (management, those charged with governance, users, and regulators) are relevant for audit quality (IAASB, 2014, p. 19; Francis 2011, p. 146). Auditors interact with stakeholders within and outside the client's company to help in evidence gathering, identifying, assessing, and responding to risks. It also helps management to benefit from observations of auditors and suggested remedies to strengthen the client's internal control and reporting frameworks contributing to an increase in audit quality (IAASB, 2014, p. 20)

The last factor is the contextual factors and is about the environment that drives financial and audit work. These factors have the potential to affect audit quality and it is therefore important for auditors to sufficiently respond to these factors during the audit process. These factors are audit regulations, litigation environment, attracting talent, financial reporting timetable, broader culture, information systems, corporate governance, applicable financial reporting framework, laws and regulations, business practices, and audit regulations (IAASB, 2014, p. 26). Francis (2011, p. 140) stated that a good legal system in a country that regulates auditing practices contributes to high audit quality. This position was collaborated with Knechel (2016, p. 216) and Martin (2013, p. 21) all

asserting that many countries now have regulatory bodies that are influencing the audit profession contributing to an increase in audit quality.

2.5.1 Effect of Advanced Technology on Audit Quality

A critical analysis of discussions so far points to the fact that audit quality can only be achieved when the input and processes are carried out properly with the right human resources, tools, and procedures to produce the desired outcome. However, advanced technologies are improving the quality of audit that outweighs the capacities of humans.

AI can extract relevant information from accounting data aiding auditors to spend more time on areas that require high-level judgment to increase audit quality (Kokina & Davenport, 2017, p. 117) and able to go through vast amounts of data and perform and perform analysis faster and which can be said to be impossible for auditors (Forbes Insight/ KPMG report, 2018, p.2; Kokina & Davenport, 2017, p. 119).

Advanced technology is aiding auditors to conduct effective audit testing by determining if all risks identified have been addressed (Bierstaker et al., 2001, p. 160). With machine learning detecting risk and misstatement is becoming easier as they are detected faster during the audit process. Predictive analytics improve the quality of audit by extracting information and identifying patterns of transaction that do not align with expected outcomes. (Forbes Insight/ KPMG report, 2018, p. 2-3). This according to Issa et al. (2016, p. 10) would decrease the probability of fraudulent activities, manipulation, and misstatements of accounting information eluding the attention of auditors.

With the help of cognitive technology, auditors can design audit works to conduct both structured and unstructured data (Forbes Insight/ KPMG report, 2018, p.2) with these, auditors are able to have a better understanding of diverse data sets to increase the quality of the audit work. This position was reiterated by Kokina & Davenport (2017, p. 116) that data analytics and artificial intelligence are suitable for structured and unstructured data to gain insight into the financial and non-financial performance of companies.

2.6 Summary and graphical model of the conceptual framework

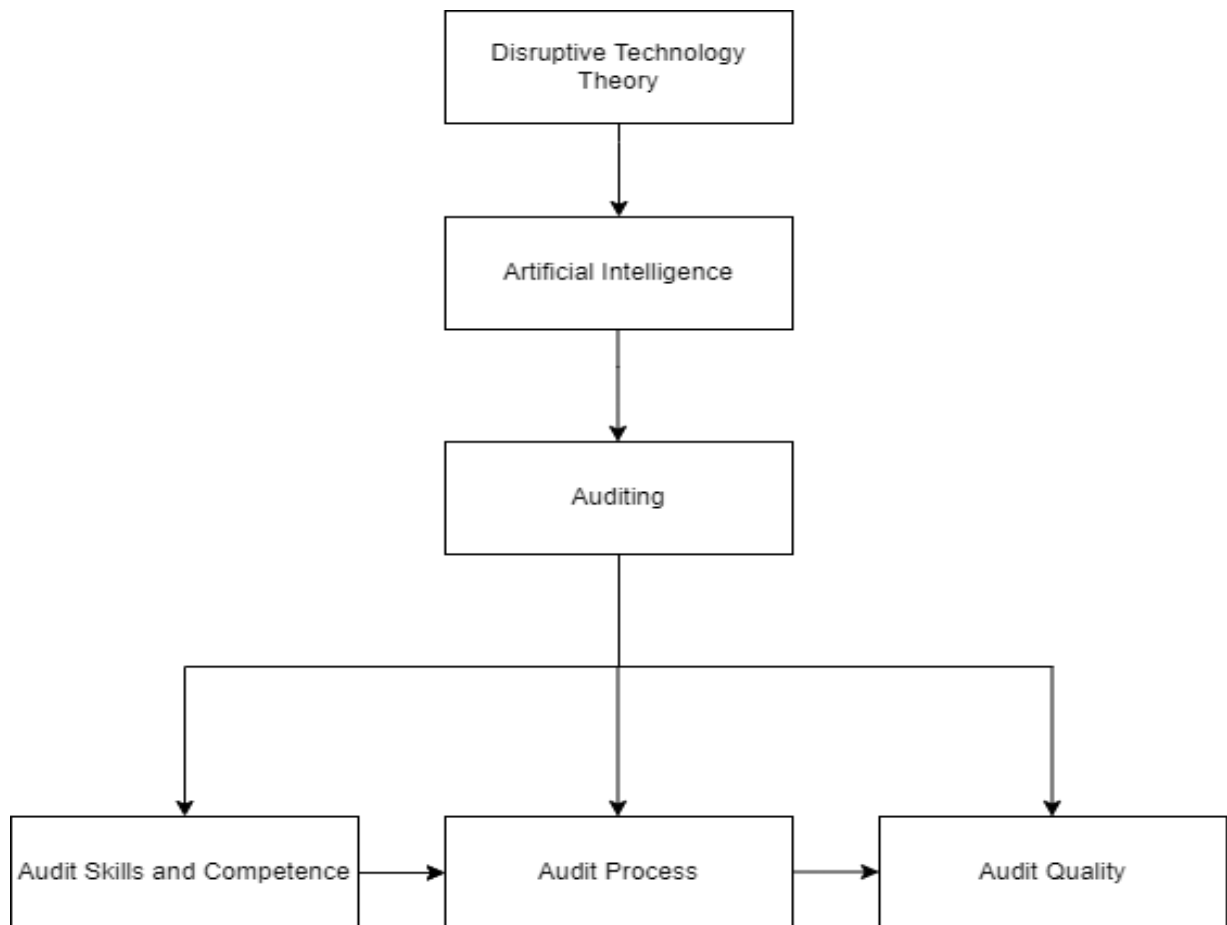


Figure 6: Graphic model of the conceptual framework

Source: Drafted by the researchers

This chapter began with exploring the disruptive innovation/technology theory as espoused by Christensen and Bowler (1995). The disruptive technology theory argues that when an innovative technology begins, it is usually disregarded in its early stages. This happens because managers may not want to sacrifice a tried and tested process which is earning considerable levels of income over an innovative technology that is not tried and tested and is unpredictable. Moreover, innovative technology may not be desirable to customers as it may be expensive and may not meet the performance requirements of the market. Christensen and Bowler (1995) further argue that with time, an innovative technology's performance requirements increase above the market's requirement. When this level is reached, innovative technology will disrupt the existing technology and become acceptable modern technology.

The focus then shifts to AI as innovative technology. Although AI has been around since the 1950s, it was not as popular and powerful as today. Just as Christensen and Bowler (1995) described in their disruptive innovation theory, the innovation's performance requirements could not meet the customer requirements at that time. Since the 1980's upwards; the introduction of more powerful computers with optimal processing speeds,

huge volumes of data, and other factors (Ergen, 2019, p. 5), the performance requirements of AI have grown exponentially, making it the ideal technology to process huge volumes of unstructured and semi-structured data and make meanings out of it. This assertion is also consistent with the characteristics of disruptive technologies as they often start as inferior technologies until their performance requirements can exceed the consumer requirements. This, therefore, establishes AI as an innovative technology. There are several AI tools which include deep learning, predictive analytics, speech recognition, image recognition, robotics, etc.

AI technologies are receiving increasing popularity in all industries over the world. For example, in medicine, AI technologies can predict the probability of a patient getting infected with a particular disease by assessing and analyzing their past medical and family history. In transportation and shipping, AI can remotely control storage conditions by relying on climate control tools to determine optimal storage conditions. AI can determine optimal performance standards for athletes, pushing their performance limits and providing vital information that the athlete himself may not be aware of. In the same vein, auditors are now relying on AI to help them deliver quality audit works. Whereas auditors previously had to sample data to test for completeness and accuracy, AI now makes it possible to test the entire data set, thereby limiting to the minimum the possibility of missing out errors, frauds, and misstatements. (AICPA, 2012, p. 4). Using input-process-output concept, this study examines the impact of AI on auditor's skills and competencies (input), audit process (process), and audit quality (output).

On the skills and competencies of auditors, it is argued that AI technologies are impacting the skills and competencies of auditors, and this will disrupt the skills sets required. According to Issa et al. (2016, p. 14), there are concerns about the negative impact of advanced technology on employment with workers worried about being replaced by machines. AI will disrupt the skill sets of auditors, as the current skills will become inefficient and therefore the need for training to learn various AI applications (Issa et al., 2016, p. 11). The skills of accounting and auditing staff are likely to be affected by AI in the future regarding reduction in entry-level jobs (Kokina & Davenport, 2017, p. 119). This will therefore require human auditors to acquire skills and competencies that are beyond these advanced technologies such as sense-making, social intelligence, novel and adaptive thinking, cross-cultural competency, computation thinking, new-media literacy, transdisciplinary, design mindset, cognitive load management, and virtual collaboration (The Institute for the Future, 2011, p. 8-12).

As AI disrupts the skill sets required to audit, the audit process is also expected to be affected. With AI, more of the audit processes and procedures would be automated, this will move auditors away from repetitive work to focus on understanding the client's business and assessing the risks of the business and industry (Kokina & Davenport, 2017, p. 117). This will help auditors to optimize the time available for audit works to help analyze broad and deeper transactions to help understand better the client's business to increase audit efficiency and quality (Kokina & Davenport, 2017, p. 119; Adiloglu & Gungor, 2019, p. 209). AI will further enhance the audit process by making it possible to examine the entire population of accounting transactions (Kokina & Davenport, 2017, p. 119) and improved chance of detecting misstatement and frauds (Adiloglu & Gungor 2019, p. 209).

With enhanced and effective automated processes, the audit quality is expected to improve. This is because with AI auditors can design audit works to conduct both structured and unstructured data (Forbes Insight/ KPMG report, 2018, p.2) with these, auditors are able to have a better understanding of diverse data sets to increase the quality of the audit work. Automation with AI would decrease the probability of fraudulent activities, manipulation, and misstatements of accounting information eluding the attention of auditors (Issa et al. 2016, p. 10).

3.0. METHODOLOGY

This Chapter is made up of methodological choices of the study. It has two parts, namely theoretical methodology, and practical Methodology. The theoretical methodology explains the philosophical assumptions of the study while the practical methodology decides the practical strategies of the study.

3.1. Theoretical Methodology

This part deals with the philosophical assumptions regarding the study. Here, the theoretical assumptions of research methodologies were discussed, and the researchers argued for the choices that are appropriate to answer the research questions. The research approach, research method, and research design were explained to guide the research.

3.1.1. Preunderstanding

Researchers do not live in isolation and are hence affected by several factors in their environment, including social, cultural, religious, etc. These factors do not only affect the researcher personally but also affect the way he/she conducts research. Preunderstanding is used to describe the concept whereby it is believed that the development of knowledge does not start from a ‘clean slate’ but is always based on some level of association with the phenomenon being studied (Alvesson & Sandberg, 2021, p. 1). Nyström & Dahlberg (2001, p. 341) argue that preunderstanding starts from the context of familiarity, and while can be beneficial to the researcher, can also be a constraint on the research. Alvesson & Sandberg (2021, p. 2) strongly argue that ‘a more deliberate, active, and systematic use of our pre-understanding can significantly enrich studies, from idea generation to evaluation of findings and theory.’ Preunderstanding, however, also creates prejudices for the researcher, and this can have an impact on how he collects, analyzes, and interprets data. Ignoring the researcher's preunderstanding and prejudices has the potential to lead to ‘*results that are primarily a reflected image of something already existing in our understanding*’ (Nyström & Dahlberg, 2001, p. 339).

To counteract this, is it very necessary for the researcher to be aware of his preunderstanding and prejudices, to be able to constantly question them, and maintain an ‘open mind’ (Nyström & Dahlberg, 2001, p. 345). Identifying our prejudices, and willingness to isolate them from the research work will offer the researcher an opportunity to see concepts from new perspectives and thereby increase knowledge. Nyström & Dahlberg (2001, p. 339) however concedes that some amount of prejudice may be situated in the unconscious state and may be difficult to access or even become aware of them. This, however, does not prevent the researcher from consciously assessing and questioning his own preunderstanding and prejudices, and the impact it could have on his research.

The authors of this work are accounting students who have had considerable exposure and experience in accounting and accounting-related topics. Critically analyzing the work of Harari (2016), *Homo Deus: A brief history of tomorrow*, coupled with the author's background in accounting informed our choice of topic. The authors are of the view that this topic is currently one of the major trends in the accounting and auditing profession. And like most ‘growing’ areas of academic research, there are usually gaps in the knowledge that will require further research, hence the need to conduct this research to

add to the knowledge. To this end, the researchers will consistently question their preunderstanding and prejudice through the course of this research. The objective is to make sure that these do not end up adversely affecting the outcome of the research. The researchers will maintain open-mindedness and impartiality in conducting the research.

3.1.2. Research Philosophy

The purpose of research is the development of knowledge, and this is influenced by the researcher's philosophical point of view. According to Saunders et al (2007, p. 101) research philosophy 'relates to the development of knowledge and the nature of knowledge.' The perspective of people is shaped by several factors, and how a researcher thinks 'knowledge' is and how it is developed will have an impact on how he conducts research. The researcher should therefore be aware of the impact his philosophical point of view will have on his research.

Researchers should motivate their choice of philosophical perspectives based on their research topic and research questions. The research topic and research question(s) should determine the philosophical perspective of the researcher for any research project. We (authors) now discuss our philosophical perspectives based on our research topic and research questions. The ontological, epistemological, and axiological standpoints define our research philosophy.

3.1.2.1 Ontology

Saunders et al (2007, p. 109) describe ontology as being 'concerned with the nature of reality and the assumptions researchers have about how the world operates.' Long et al (2000, p. 190) look at social ontology as the 'assumptions held about the nature of reality.' Some researchers argue that reality is objective and can be studied independently of the actions/emotions of the researcher. This implies that the researcher will not have any influence on the phenomena being studied and will be able to draw objective conclusions from the study. Others are of the view that reality is a social construct that cannot be objectively alienated from the researcher, hence the emotions/feelings, etc., of the researcher and phenomenon being studied will have an impact on the conclusions of the study (Long et al., 2000, p. 190 – 191).

Ontology can therefore be discussed from two main perspectives, objectivism, and subjectivism. Objectivism relates to the perspective held by researchers that social reality is independent and distinct from social actors. Hence social realities can be studied independently without any influences. Subjectivism on the other hand argues that there are relationships between the social actor and the phenomenon being studied, and such relationships may influence research (Saunders et al., 2007, p. 108 - 109)

The authors are convinced that the objective ontological perspective will not be the most appropriate to achieve the objectives of this research. The primary data collection is through interviews. Responses to and analysis of interviews will be based on the 'social construct' of the respondent and the researcher. The research topic and questions also may not make it appropriate for it to be assessed objectively since concepts like skills and competence, and audit quality is subjective, and its interpretation will be based on the respondent's knowledge which will not be same for all respondents.

Based on the topic and the research question of this research, the authors are of the view that the subjective ontological perspective will be most appropriate to achieving the objective of the research. The authors agree that social reality is continuously influenced by social actors. This is because all the stakeholders (researchers and participants) in this research are social actors. Social actors also may have a different view of reality, depending on their beliefs and social values. The stakeholders also have varying degrees of preunderstanding of the topic and may interpret concepts differently based on several factors.

3.1.2.2. Epistemology

Epistemology concerns itself with what knowledge is, what can be described as acceptable knowledge in a particular field of study, and the assumptions regarding the best way to study this knowledge (Saunders et al, 2007, p. 102; Bhattacharjee, 2012, p. 18). There are three broad categories of epistemological standpoint. Positivism, interpretivism and realism.

Positivists argue that the social reality is distinct from the social actors. That makes them tangible because they can be seen and felt. They believe that relationships, cause, and effect, generalizations, etc., can be studied independently without involving the researcher because these are observable (Saunders et al, 2007, p. 103). Natural scientists lean towards this epistemological standpoint. Interpretists on the other hand, hold the belief that social reality cannot be isolated from social actors, and that the actions and inactions of social actors influence social reality. Therefore, they argue that in studying a social reality, the impact of social actors (feelings, emotions, etc.) cannot be isolated. Interpretists, therefore, interpret social reality with the meaning they assign to these realities (Saunders et al, 2007, p. 103; Bhattacharjee, 2012, p. 19). Realists believe there are clear distinctions between social reality and social actors, but also believe there are 'deep relationships between social phenomena which cannot be observed but are necessary for the explanation of how social phenomena and relationships are built' (Marsh & Furlong, 2002, p. 20). Realism employs elements of both positivism and interpretivism.

The authors of this research have adopted the interpretist epistemological perspective. The authors believe that this position will be best suited to accomplish their research objective because the mode of data collection will be interview. This will require respondents to a set of questions that will be analyzed. The authors are aware that respondents will answer these questions based on several factors including but not limited to their educational backgrounds, position in the firm, values, cultural nuances, exposure to certain tools, emotions, etc. The authors, therefore, anticipate that answers given to the questions will not be independent of these social phenomena. The authors are aware of their preunderstanding of the topic and will structure the analysis to reflect as close as possible to the answers given by the respondents. In this regard, the authors will consistently question themselves and review the work to make sure their knowledge does not affect the outcome of the research.

3.1.3. Research Approach

Theorizing is a key element of research because it shapes the research design and aligns it with a particular direction. Researchers, therefore, need to have a firm grasp of theory

and how it will play a role in shaping the research design. Saunders et al, (2007, p. 117) opine that the clearer the researcher is about theory at the beginning of the research work, the easier it will be in addressing the issue of research design. Deduction and induction are the two main approaches to research design. According to Saunders et al, (2007, p. 117), whereas the deduction approach concerns itself with developing and testing theories using hypotheses, induction uses data to build a theory.

Deduction as an approach to research design is defined by Bhattacharjee (2012, pp. 14-15) as '*the process of drawing conclusions about a phenomenon or behavior based on theoretical or logical reasons and an initial set of premises.*' Deduction by implication, therefore, sets off with a theory, and hypotheses are designed to test the theory for confirmation. According to Saunders et al. (2007, p. 117) the deductive approach has its roots in scientific research and is favored by researchers in the natural sciences and therefore subscribes to ontological objectivism and epistemological positivism. Bhattacharjee (2012, pp. 15) again defines induction as '*the process of drawing conclusions based on facts or observed evidence*'. Unlike the deductive approach, induction begins from observing data or evidence first and then using that to build a theory. Induction was birthed by social science researchers because it was difficult using the deductive approach. They found the deductive approach emphasized a cause-effect link be made between variables without factoring in factors that play a role in how people make interpretation of their social world problematic. Induction is ontologically subjective and epistemologically interpretist (Saunders et al., 2007, p. 118). Though these two approaches seem very distant and parallel, Saunders et al. (2007, p. 119) argue that it is perfectly possible and even advantageous to combine both deductive and inductive approaches in various aspects of research work to achieve the objective of the research.

The authors of this research have not set out to test theories, but to study data and evidence to build a theory. The objective of this research is to examine the impact of AI on auditors' skills and competence, audit process, and audit quality. This will involve the reliance on subjective opinions from respondents, and their emotions, feelings, educational background, etc. will play a role in their responses. The authors therefore will adopt the inductive approach to research since it will be more effective in meeting the objective of the research. It must also be emphasized that although the authors have adopted the inductive approach, several other literature and theories were relied upon to shape the contextual framework of this research, therefore there will be elements of the deductive approach in this work. This is consistent with the assertion by Saunders et al. (2007, p. 119) both deductive and inductive approaches can be combined advantageously.

3.1.4. Research Method

There are two major approaches to research methods that researchers can use. These are quantitative and qualitative methodologies (Yilmaz, 2013, p. 311). Yilmaz (2013, p. 311) further argues that the choice of methodology selected will be influenced by the philosophical, theoretical, and methodological standpoint of the research. It is, however, acceptable for researchers to combine elements of both qualitative and quantitative research (Saunders et al., 2007, p. 145).

Quantitative research method uses numerical data and analyses, using mathematical and statistical methods and tools to derive patterns and relationships between variables

(Yilmaz, 2013, p. 311; Bhattacharjee, 2012, pp. 119). Proponents of this research method believe social behavior can be objectively measured and relationships between variables established because social phenomena have an objective reality that is independent of the subjects being studied, hence, quantitative research is grounded in objectivists ontology and positivist epistemology (Yilmaz, 2013, p. 312).

Qualitative research according to Yilmaz (2013, p. 312) is '*an emergent, inductive, and interpretive approach to the study of people, cases, phenomena, social situations and processes in their natural settings to reveal in descriptive terms the meanings that people attach to their experiences of the world*'.

Qualitative research method is therefore based on subjective ontology and interpretist epistemology because it recognizes the experiences, feelings, emotions of the subject being studied in drawing conclusions about the phenomena of study. The researcher, therefore, develops a close relationship with the subject of study to understand their nuances and how these affect their behavior (Yilmaz, 2013, p. 312-313).

The objective of this research is to determine (if any) the impact that AI has on auditors' skills and competencies, audit process, and audit quality. These the researchers believe will be subjective and based on each respondent's exposure, experience, position in the firm, etc. The researchers, being aware of these challenges are of the view that a qualitative research method will be the most appropriate in achieving the objective of this research. This is because the experiences and exposure etc., of respondents, cannot be isolated and will therefore have an influence on the responses from the respondents. Moreover, the philosophical standpoints discussed so far, coupled with the researchers' preunderstanding will require the use of a qualitative research method to be able to achieve the objective of the research.

3.1.5. Research Design

Every research work has a purpose, and this defines how the research questions are framed. The purpose of research can be framed along three lines, exploratory, descriptive, and explanatory (Neuman, 2014, p. 38). Exploratory research is used when the topic is new, with limited literature, and the researchers will want to know more about it. It helps to bring clarity to understanding some phenomena or problems (Neuman, 2014, p. 38; Saunders et al, 2007, p. 133). The objective of descriptive research is to provide a clear picture of the state of people, phenomena, or events. This can become a necessary addition to exploratory or explanatory research (Neuman, 2014, pp. 38 - 39; Saunders et al, 2007, p. 134). Explanatory research answers the question 'why' and seeks to provide an explanation for the occurrence or non-occurrence of certain phenomena or events. Explanatory research usually builds on exploratory and descriptive research. This research places emphasis on studying variables and identifying relationships between them (Neuman, 2014, p. 40; Saunders et al, 2007, p. 134).

The researchers believe the exploratory research design is best suited to answer research questions and fulfill the research objective. The researchers though have a preunderstanding of the topic but concede this may be limited and lacks depth. The participants also may have limited knowledge about the topic in its entirety, especially because this field of study is not matured. Therefore, the research would contribute to knowledge in the field of study.

3.2. Practical Methodology

In this section, the researchers described the practical methodologies undertaken in our thesis work. To properly answer the research questions, the researchers undertake data collection. The Researchers further chose sampling methods, practical selection, outline the interview guide and process, data analysis, and how the search for literature was conducted to enrich the study.

3.2.1. Data Collection

Data are facts that serve as the basis for reasoning, calculation, or analysis. These are sets of values or variables in qualitative or quantitative nature (Wikipedia as of March 2022). Yin (2016, p. 138) defined data as the recorded element derived from conducting an experiment or observation or experience or any other similar situations. To be able to answer the research question, relevant data must be collected for analysis. The quality of data collected is therefore particularly important as it will influence the analysis and conclusions.

Data can be classified into two, these are primary and secondary data (Saunders et al., 2007, p. 246; Patel & Patel, 2019, p. 52). The researchers classified the data collection process into two categories, the first is data collected to identify the research gap, formulation of research questions, and conceptual framework. This data was retrieved from journal articles, textbooks, websites of auditing firms and regulatory bodies. The data retrieved from all these sources were critically assessed and considered to be relevant for the thesis work and are secondary data. The second category is what the researchers termed the primary source of data collection to help answer the research questions.

According to Yin (2016, p. 138) primary sources of data collection methods for qualitative research are interview, observation, collecting and examining, and feeling. The interview involves having conversations (that includes verbal and body) with participants to collect data. Observation is about observing people's behavior, gestures, and how they interact with others and their environment without having to communicate with them. Collecting and examining data involves gathering data through surveys, text or other printed materials, graphics, or archives. Lastly, the feeling is about gathering data through having some sensation (Example, cold or warmth, interpretation of people's level of comfort (Yin, 2016, p. 138).

Though the researchers could make use of any of the four data collection methods, we are of the view that interviews will be the best option to enable us to answer the research questions. The researchers are aware that there may be challenges with having participants to partake in interviews during these times when auditors are mostly finalizing their audit works. The researchers overcame this challenge by making contacts with participants far in advance so that when planning their calendar, this will be included.

An interview is a great tool to gather valid and reliable data to answer research questions and objectives. This involves the researcher asking questions for the participant to answer, usually face to face. (Saunders et al., 2007, p. 310) Interviews can be structured, semi-structured, or unstructured, and the choice of each method depends on the research objective. A structured interview involves the researcher asking each participant specific and standardized questions in a predetermined manner and format. Data from structured interviews are quantified and used in quantitative studies. Semi-structured interviews

make use of some standardized questions but also give room for asking follow-up questions to learn more about the phenomena been studied. This is used for qualitative studies. Unstructured interviews do not involve the use of any standardized questions. Questions are asked not according to any format and are useful for qualitative studies. (Saunders et al., 2007, pp. 312 - 314)

The researchers used semi-structured interviews to gather data to be able to answer the research questions. A semi-structured interview was chosen because it makes it possible to set standardized questions to answer the research questions. It also permits the researchers to ask follow-up questions making it possible to acquire detailed explanations. Lastly, A semi-structured interview serves as a guide to the researchers and gives an opportunity for open discussion between the participants and researchers (Bryman & Bell, 2011, p. 467).

3.2.2. Sampling

The population in this thesis work is made up of all auditors working in audit firms in Sweden. However, the population is too large for our work, therefore, the researchers decided to have a sample size to collect the relevant data to be able to answer the research questions. A sampling technique is a method to collect data from a subset or subgroup rather than the entire population (Saunders et al., 2007, p. 204). Sampling techniques can be classified into two, probability and non-probability samplings. In probability sampling, the chance of being selected from the population is known, whilst in non-probability sampling, the probability of being selected is unknown (Saunders et al., 2007, p. 207). There are four types of probability sampling, these are simple random sampling, systematic sampling, stratified sampling, and cluster sampling, the suitability of the type to adopt depends on knowledge of the entire population, when researchers have the list of the population, then the first three can be conducted or otherwise the last in the event of no list of the population (Miller & Yang, p. 217). In probability sampling, it is possible to estimate statistically the characteristics of the population from the sample size and the result can be generalized (Saunders et al., 2007, p. 207; Bryman & Bell, 2011, 185). Probability sampling uses a large sample size because the larger the size the lower the error of generalization to the population and it is suitable for quantitative research (Saunders et al., 2007, p. 210).

Bryman & Bell, (2011, p. 190) classified non-probability sampling into three, convenience sampling, snowball sampling, and quota sampling. Convenience sampling is a sampling method that is easily accessible to researchers. This type of sampling is convenient, so it is easier to distribute the questionnaires and receive all questionnaires back from the correspondence but lacks the possibility to generalize the results (Bryman & Bell, 2011, p. 190). According to Saunders et al., (2007, p. 234) convenient samplings are prone to bias and influences beyond the control of the researchers. In snowball sampling, the researchers contact small groups of people in the population and then use them to reach out to other relevant people in the population (Bryman & Bell, 2011, p. 193; Saunders et al., 2007, p. 232). Quota Sampling is choosing a sample that reflects or represents diverse groups or categorizations in terms of age, sex, nationality, culture, and status (Bryman & Bell, 2011, p. 193). This makes quota sampling non-random and has similar variables as the population (Saunders et al., 2007, p. 227). Non-probability sampling makes it possible to select the sample size based on judgements of researchers

to include participants with in-depth knowledge on the research question to provide better input for the study (Saunders et al., 2007, p. 226). Therefore, non-probability sampling is suitable for a qualitative study to provide the participants with the opportunity to give their opinion, perception, and insights on the research question.

Based on the critical analysis of the sampling methods explained above, the researchers decided to adopt non-probability sampling and specifically snowball sampling in the research work. This is because the probability of selection of participants in the population is unknown as it will depend on initial contacts to get other participants. Additionally, the research questions required participants with special knowledge, skills, and experience in the field of auditing and its practices to be able to provide relevant data to answer the research questions for better analysis. Therefore, snowball sampling is the most suitable method among the three non-probability sampling methods to be used for answering the research questions.

3.2.3. Practical Selection

To select the participants for the study, the researchers decided to collect data from auditors in the big 4 auditing firms. This is because based on the initial investigation and interactions with auditors and practitioners it was evident that many audit firms which are in the middle and lower tier are either not conversant with the use of AI in auditing or their firms have not started using any form of AI. Therefore, to collect relevant input in answering the research questions, the researchers decided to use auditors from the big 4 firms as they have more knowledge of the research themes.

The researchers intend to collect data from auditors from all levels or positions. Auditors at various levels from entry to top management levels were interviewed. This is necessary to have a better representative in the study and to understand the concerns and opinions of auditors at all levels for better analysis and conclusion.

The researchers contacted the participants using several ways. The researchers initially contacted friends and auditors in the big 4 firms who later introduced their colleagues. The researchers further reached out to auditors through LinkedIn and visited the offices of some audit firms. In all, fifty-one auditors were contacted for data collection for the study.

The interviews were conducted online using various video conferencing platforms such as zoom, google meet, and Microsoft teams. The researchers conducted the interview online because it was more convenient for both the participants and the researchers. In addition, to convenience, online data collection methods required minimum resources (staff, time, and cost) and are faster as they are administered online (Glasow, 2005, p. 6; Miller & Yang, 2008, p. 248; Bryman & Bell, 2011, p. 232 - 233). The researchers documented the interview by taking notes. The researchers chose to take notes over audio recording because audio-recording restrains interview responses and reduces reliability, technical problems or failures, and time to transcribe the audio recordings (Saunders et al., 2007, p. 334). The choice to take notes also increased the anonymity and confidentiality of the participants as their personal identities were not captured.

Before the interview was conducted, the researchers sent the interview guide to the participants for them to be familiarized with the interview questions prior to the interview.

This will give them ample time to reflect on the questions and to give in-depth responses. Additionally, an information sheet (see appendix 3) was also sent which includes the purpose of the study and emphasizes the ethical considerations of the study. This information sheet provided assurance of the ethical considerations and their rights as participants. The interview guides were sent to the participants between 28th to 30th March 2022 while the interviews were conducted between 13th to 29th of April 2022.

3.2.4. Interview Guide and Process

Planning and preparing for the interview are as important as the interview itself. It is therefore imperative for the researchers to have a plan of the interview beforehand. An interview guide helps the researcher to focus the interview on questions that will help to answer the research questions, and provide a guide for asking follow-up questions, and to eliminate the possibility of the interview straying into topics which are not relevant for answering the research questions. (Bryman & Bell, 2011, pp. 473-477)

In drafting the interview guide, the researchers allocated the research questions into themes. This is important to help develop the research questions under each theme. The interview questions were drafted to answer the research questions and divided into four sections. The first section is made up of questions to collect general information about the participants. The second section is about the impact of AI on auditors' skills and competencies. The third section focuses on the impact of AI on the audit process and, finally, the fourth section is about the impact of AI on audit quality. The researchers followed the interview guide in asking the questions to the participants. However, the researchers asked follow-up questions to get a better understanding of the issues discussed (Bryman & Bell, 2011, p. 475). It, therefore, means that the interview guide served as a guide to introduce and start the discussion, but the researchers do not restrict the discussion to only the questions in the interview guide.

To formulate the interview guide, the researchers used the process recommended by Bryman & Bell (2011, p. 477) which is made up of general research area, specific research questions, interview topics, formulate interview questions, revise or review interview questions, pilot guide, identify novel issues, revise interview questions and finalize guide. Find below the graphical flow of the process.

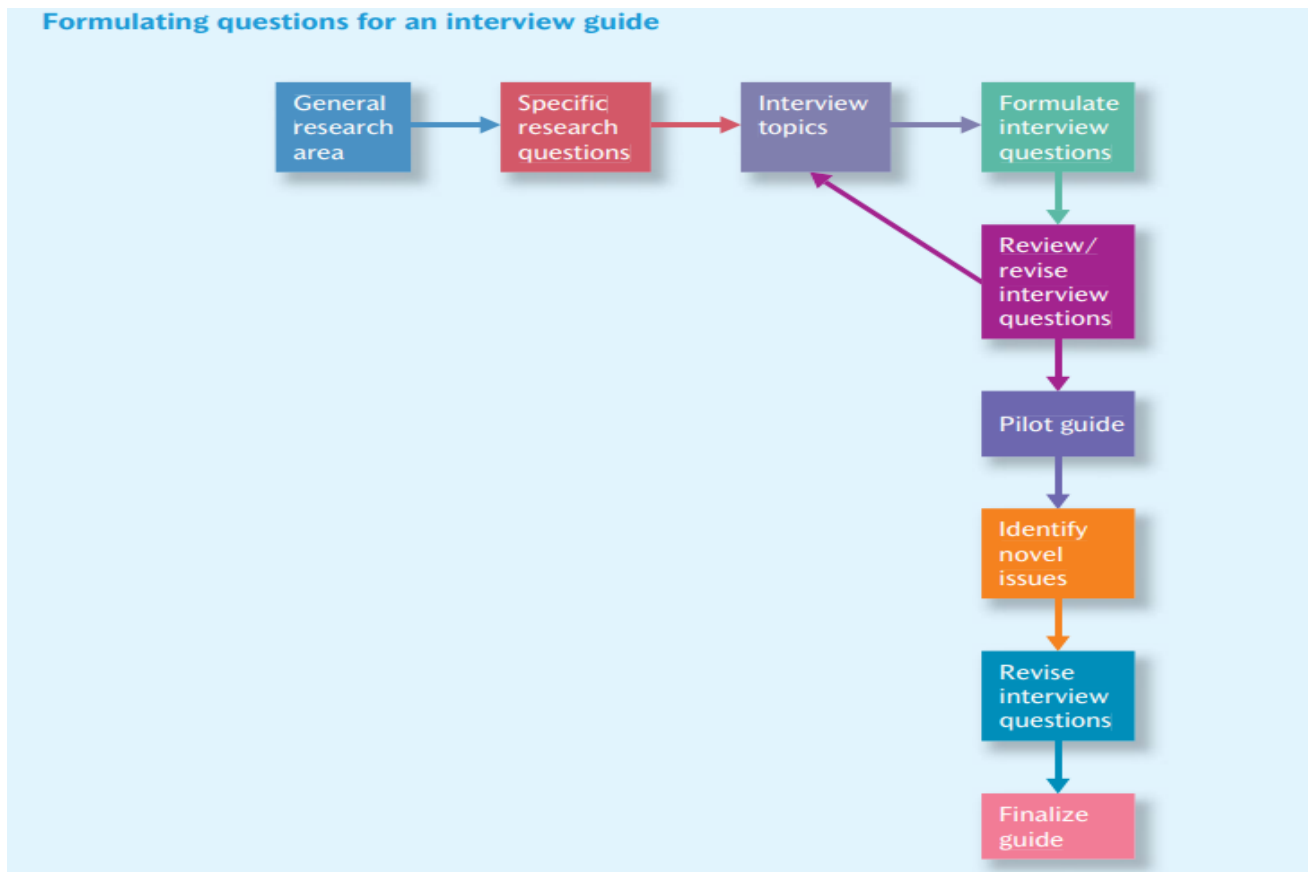


Figure 7: Formulating interview guide

Source: Bryman & Bell (2011, p. 477)

The general research area identified by the researcher is the impact of AI on auditing. Based on the general research area identified, the researchers came out with specific research questions which include the impact of AI on the skills and competencies of auditors, the impact of AI on audit process, and lastly the impact of AI on audit quality. The interview topics identified were skills and competencies, audit process, and audit quality. Based on these broad interview topics, the researchers formulated specific interview questions under each interview topic (see appendix 3). However, the researchers asked the participants introductory questions to get background information of the participants concerning their positions, years of experience, education backgrounds, and their business clients, among others. To review or revise the interview questions, the researchers sent the interview questions to the thesis supervisor and some colleagues for their input and feedback. The feedback received helped the researchers to review and revise the questions before finalizing the entire document.

The finalized interview guide was sent to all the participants for them to be familiarized with the interview questions prior to the interview. This gave them ample time to reflect on the questions and to give in-depth responses. The interviews were conducted online using various video conferencing platforms. The recording of the interview was done by taking notes. The researchers chose to take notes over audio recording because audio-recording restrains interview responses and reduces reliability, technical problems or failures, and time to transcribe the audio recordings (Saunders et al., 2007, p. 334). The choice to take notes also increased the anonymity and confidentiality of the participants

as their personal identities were not captured. After each interview, the researchers immediately put together the notes and all the discussion before another interview was conducted. This was done to make sure that the researchers do not exchange the responses of the participants. Secondly because immediately after the interview, is it possible to remember the discussions than waiting for a much longer time. The notes were taken and recorded separately, find below the interview details.

Table 1: Interview Details

Source: Drafted by the researchers

| Code | Positions | Interview Date | Time Spent | Medium |
|-------------|-------------------|-----------------------|-------------------|-----------------|
| P1 | Senior Auditor | 2022-04-13 | 0:42: 15 | Google Meet |
| P2 | Assistant Manager | 2022-04-19 | 0:38:22 | Microsoft Teams |
| P3 | Senior Manager | 2022-04-21 | 0:40:05 | Google Meet |
| P4 | Senior Manager | 2022-04-23 | 0:35: 56 | Microsoft Teams |
| P5 | Audit Assistant | 2022-04- 25 | 0:37:48 | Zoom |
| P6 | Manager | 2022-04-26 | 0:39:12 | Zoom |
| P7 | Auditor | 2022-04-27 | 0:36:45 | Zoom |
| P8 | Audit Assistant | 2022-04-29 | 0:38:10 | Zoom |

The table above shows details of the interview. It shows the special codes assigned to each participant, the position of the participant, the date the interview was conducted, the time spent on each interview and the medium used for the video conferencing. The participants were drawn from the big four auditing firms in Sweden and are spread across several municipalities. These participants have varied skills, experiences, educational background, and years of practice.

3.2.5. Data Analysis

Interviewing participants is not enough and does not end the research process. The data collected needs to be analyzed for it to be meaningful (Saunders, 2007, p. 470), to fulfil the objective of the research and contribute to knowledge. According to Bryman & Bell (2011, p. 171) data collected in a qualitative study is rich but it is important to analyze the data critically and truly, however, how to conduct the analysis is difficult as there are

no established rules compared to quantitative studies. This position was affirmed by Saunders (2007, p. 478) that there is no standardized approach to analyzing qualitative data.

Even though qualitative data has no established rules to use in the analysis (Bryman & Bell, 2011, p. 171), Saunder, (2007, p. 492) classified qualitative data analysis procedures into six, these are data display and analysis, template analysis, analytical induction, grounded theory, discourse analysis, and narrative analysis. Data display and analysis involve focusing on some parts of the data, displaying the data visually to identify relationships and trends in drawing conclusions (Saunder, 2007, p. 492 - 494). The template analysis is about categorizing the data collected to represent themes. In short, this method involves categorizing and utilizing data extracted from the correspondent to identify patterns and relationships (Saunder, 2007, p. 496 - 497). The analytic induction method involves definitions of research questions followed by explaining the hypotheses of the questions formulated and then collecting data (Saunder, 2007, p. 497; Bryman & Bell, 2011, p. 574). In case of differences in the hypothesis, it is either redefined to eliminate the negative scenarios or redefined to continue with the data collection (Bryman & Bell, 2011, p. 575). The grounded theory involves generating a theory that comes out as a theme from the data collected and analyzed (Saunder, 2007, p. 498; Bryman & Bell, 2011, p. 576). Discourse analysis is about analyzing how and why a language is used in a social context. That is identifying how languages change in society and finally, narrative analysis is based on accounts and experiences of participants that take the form of storytelling. The method of data collection for this is an in-depth interview and conducive for inductive approaches (Saunder, 2007, p. 502 - 504).

After critically analyzing the six data analysis methods explained above, the researchers decided to use the template analysis method. This is because it is the most suitable method for organizing and analyzing the data to draw a relevant conclusion (Saunder, 2007, p. 479). It follows the general procedure for analyzing both inductive and deductive reasoning (Saunder, 2007, p. 496). Finally, it involves coding, categorizing, and utilizing data extracted to identify patterns and relationships to arrive at a relevant conclusion (Saunder, 2007, p. 497).

To conduct the analysis, the data collected must be prepared. We will first assign participants codes (Examples, P1, P2, P3, etc.) to make them anonymous and will appropriately save their responses for analysis (Saunders, 2007, p. 478). Then organize the data collected, Saunder (2007, p. 479) sets out procedures to follow, which include categorization, uniting data, recognizing relationships and developing categories, and developing and testing theories. The categorization involves classifying the data into groups, the researchers will categorize the data collected in accordance with the research questions. Utilizing the data is about attaching the data collected to each group, so the researchers will arrange the data collected to their respective groups. Recognizing the relationship involves identifying patterns in the data arranged, this will help in the analysis. The final procedure is developing and testing theories, with this, any relationship within the categories can be tested to arrive at a conclusion (Saunders, 2007, p. 480 - 482).

3.2.6. Literature Search

In conducting the research, the researchers searched for existing related literature. Even though searching for literature is tedious and time-consuming (Saunders, 2007, p. 70), it is a necessary task to get information on the research question and to meet the objectives of the research (Saunders, 2007, p. 71). To undertake the literature search, the researchers drafted a search strategy that includes the search parameters, keywords and terms, database and search engines, and criteria in selecting relevant papers (Saunders, 2007, p. 70).

The search parameters of the research are critical to guide the subject area of the research, the type of literature to use, and the publication period (Saunders, 2007, p. 71). The researchers identified the subject areas of the research as auditing and advanced technology, the type of literature focused on was academic journals, textbooks, and peer-reviewed articles. The researchers tried to use current publications as much as possible for academic journals and peer-reviewed articles to get more recent studies on the topic but for textbooks (theories and definitions of terms) the researchers used the original author's or inventor's work to get the primary meanings, understanding, and ideologies. Dictionary and Wikipedia were also used primarily to get definitions for terms that could not be found in any other source.

The researchers used keywords to retrieve relevant articles. According to Saunders (2007, p. 71) keywords are the terms that describe the research questions that help in retrieving relevant literature. The researchers use keywords such as Advanced technology, disruptive technology, Artificial intelligence, Auditors' skill and competence, audit process, and audit quality.

The researchers used Google Scholar search engine and Umea University Library as the main database to retrieve scholarly and published articles. The literature in the university library is mostly peer-reviewed and therefore contains relevant information for our research. The researchers also used publications from the big 4 auditing firms on the research question for relevant theoretical and practical literature.

4.0. EMPIRICAL RESULT AND FINDING

This chapter presents the empirical results of the data collected using a semi-structured interview. In all, eight participants were interviewed. The authors first gave a brief background summary of the participants then followed by data collected to answer the research question as structured in the conceptual framework.

4.1. Background

The research is to assess the impact of AI on auditors' skills, competencies, audit process, and audit quality. A qualitative approach was adopted to conduct the research using semi-structured- interview as a means of data collection. The participants were drawn from the big four auditing firms in Sweden and are spread across several municipalities. The researchers decided to use the big four firms because they have started using AI tools in their assurance services and therefore have more knowledge on the subject matter. The interviews were conducted between 13th April to 29th April 2022. The researchers sent email containing interview guides to over 20 participants but only eight responded and gave approval for the interview. These participants have varied skills, experiences, educational background, and years of practice. Table 2 below shows the description of the participants.

The interview guides (see appendix 3) were sent to the participants two weeks before the interview. This is to give the participants enough notice, opportunity to plan, and allocate time within their busy schedules for the interview. The interview guide was drafted to help answer the research questions. It includes different sets of questions made up of preliminary questions; the educational background, years of practice, positions of the participants, and the types of AI they are familiar with. Further questions were asked to assess the impact of AI on the auditors' skills, competencies, audit process, and audit quality. The interviews were conducted using various video conferencing platforms and the recordings were done by taking notes. As the researchers adopted a semi-structured approach, follow-up questions were asked beyond the interview guide to have in-depth knowledge. Each interview section took between 35 minutes to 45 minutes.

Participant 1 is a Senior Auditor in one of the big four firms in Umeå. The auditor has five years of work experience in auditing working on medium to large companies in the municipality. The auditor has a bachelor's degree in business administration majoring in Economics.

Participant 2 is an Assistant Manager in one of the big four firms in Stockholm. The auditor has six years of experience in auditing and has clients which are mostly government institutions. The auditor has a master's in business administration (Accounting option).

Participant 3 is a Senior Manager in one of the big four firms in Umeå. The auditor has thirteen years of experience with clients in small to medium-scale enterprises. The auditor has a master's in business administration (Auditing as major).

Participant 4 is a Senior Manager in one of the big four firms in Gothenburg. The auditor has ten years of experience in auditing and has clients which are mostly large manufacturing companies. The auditor has a master's degree in business administration (Accounting major)

Table 2: Summary Background of participants

Source: Drafted by the researchers

| Code | Role/Position | Organization | Years of Experience | Educational Qualification | Clients audited |
|-------------|----------------------|---------------------|----------------------------|---|-------------------------------|
| P1 | Senior Auditor | Big Four | 5 | Bachelor's degree in business administration in Economics | Medium to Large companies |
| P2 | Assistant Manager | Big Four | 6 | Master's in business administration (Accounting option) | Government Institutions |
| P3 | Senior Manager | Big Four | 13 | Master's in business administration (Auditing option) | SME's |
| P4 | Senior Manager | Big Four | 10 | Master's in business administration (Accounting option) | Large Manufacturing Companies |
| P5 | Audit Assistant | Big Four | 3 | Bachelor's degree in business administration (Accounting option). | SME's |
| P6 | Manager | Big Four | 9 | Master's in business administration (Finance option) | Financial Institutions |
| P7 | Auditor | Big Four | 4 | Bachelor's degree in business administration (Accounting option). | Medium to Large Companies |
| P8 | Audit Assistant | Big Four | 2 | Bachelor's degree in business administration (Finance option) | SME's |

Participant 5 is an Audit Assistant in one of the big four firms in Sundsvall. The auditor has three years of working experience with clients in small and medium-scale enterprises. The auditor has a bachelor's degree in business administration (Accounting option).

Participant 6 is a manager in one of the big four firms in Stockholm. The auditor has nine years of experience in auditing and has clients in the financial industry. The auditor has a master's degree in business administration (Finance option).

Participant 7 is an auditor in one of the big four firms in Gothenburg. The auditor has four years of experience and has clients in medium to large companies. The auditor has a bachelor's degree in business administration (Accounting option).

Participant 8 is an audit assistant in one of the big four firms in Gothenburg. The auditor has two years of experience in auditing clients in small to medium enterprises. The auditor has a bachelor's degree in business administration (Finance option).

As part of the preliminary questions, the auditors were asked to identify their involvement or usage of any AI tools. The responses varied ranging from no usage or involvement to more experience use of AI tools in audit engagements. Participants 3 even though have good knowledge on AI and its applications, the auditor is currently not using any form of AI tool, but all other participants are currently using AI tool in their work.

“My audit team is using AI tool in our audit engagement”. [P1]

“The firm had deployed an AI tool and auditors in the assurance service have started using it, but I am particularly not using any”. [P3]

“We have started using AI tools for audit work for about two years now”. [P4]

When asked which type of AI tools the auditors used or are aware of, most of them mentioned Power BI tools as the one they are currently using and smart contracts, speech to text recognition, and smart glasses as those they are aware of.

“I am currently using Power BI tool in my audit engagement”. [P2]

“In my audit team, we have been using Power BI tools for about three years”. [P6]

“I have been using Power BI tool, but I am aware that some big four firms in other countries use smart glasses and smart contracts”. [P7]

4.2. Skills and Competences

Technology is impacting the skills and competencies of auditors as it continues to disrupt how audits are conducted. There are concerns among auditors and researchers about the impact of AI on the skills and competencies of auditors. Many are of the opinion that the emergence of AI could disrupt the skills set of the next generation of auditors to the extent that humans could be replaced with machines. However, others disagree and said it will only aid or enhance the work of auditors.

To assess these concerns and to answer the research questions, the researchers asked the participants several questions. To start with the researchers asked their opinion on the impact of AI on auditors in general. The responses were varied, some think it could shift the focus of auditing, others believe it is instrumental to efficiency and effectiveness in auditing but there are also concerns on job losses.

“It shifts focus and skills from sampling and substantive testing to analyzing data and deviations from trends and expected outcomes”. [P2]

“AI has helped auditors to plan and conduct audits more effectively. It has been extremely useful in risk assessment and identification. It also helps in conducting audits faster and therefore meeting deadlines”. [P4]

"AI is helping auditors to perform their audit functions more effectively and efficiently but it likely it will reduce the number of auditors that will be required to perform assurance services". [P5]

"It has made the work of the auditor easier but there are concerns also that it may create some redundancy in the profession". [P7]

Participants believed that AI would affect the skills and competencies of auditors. Some are of the opinion that a different skills set may be required. However, according to others AI will enhance the competencies of auditors.

"It will demand a better understanding of data. That is how to retrieve and use the information generated by AI. A better understanding of IT and new ways of approaching the audit". [P2]

"AI is capable of performing more repetitive tasks, for that matter, the skills set that may be required of auditors in the future may move to more problem-solving and decision making". [P4]

"Auditors will be required to possess skill sets that AI cannot provide. This is particularly important for auditors to continue to be useful in the industry". [P5]

"With AI, the skills and competences of auditor will be enhanced and enable us to deliver better services to audit clients". [P6]

"AI will improve auditor's competency of making accurate decision making as the repetitive works will be done by machine allowing the auditor more time to spend to improve decision making". [P8]

The participants believed that AI will further change the relevant skills and competencies of auditors. This position was shared by all the participants interviewed. The following are the responses.

"The critical and relevant skills of auditors are critical thinking, analysis, reasoning, and problem solving". [P1]

"The skills of auditors are shifting towards sales and customer focus, transforming numbers into presentations and reports tailor-made for each company and the competence to explain them easily to the understanding of the client". [P3]

"In today's business and auditing environment, auditors are expected to be conversant with social and cultural norms, have high good judgment and problem-solving skills". [P5]

"Auditors must possess proficiency in data extraction and analysis, critical thinking, laws and governance issues in their country of operation as well as global political issues". [P6]

"It is important for auditors to acquire strong IT, data management, data analysis skills in order to operate in an AI audit environment". [P7]

The participants are of the opinion that for auditors to be effective and operate in an AI environment, there is a need for training by the audit firms. The big four firms have been providing training programs to staff for them to be able to operate effectively.

“A basic understanding of system communications, a deeper understanding of how to inspect, test and understand IT-automated systems and controls”. [P2]

“My firm periodically organizes training workshops for auditors on general IT skills and specifically how to use any new tools or software to effectively operate the AI programs”. [P4]

“IT education and training are crucial in conducting audits with AI. I must say that my audit team members were trained, and we sometimes get further support from staff members in the IT department when necessary. In some audit engagements, the team is even made-up of people with IT backgrounds, and these help us to share ideas to undertake the audit or task”. [P5]

“Auditors need more IT training to help them keep abreast with the current fast-paced technological business environment”. [P6]

“IT, data management and analysis training. It is important to know how to use AI tools to collect the data on the client's business, secure the data collected, and effectively analyze the data collected are all the relevant training that auditors must possess”. [P7]

When the participants were asked if they think the academic curriculum should be changed or improved to better prepare the next generation of students for the field of audit, there were different opinions. Participants 1, 3, and 5 think there is no need.

“All the audit firms do not use the same type of AI tools. Even if the university trains students how to use a particular AI tool, when these students are employed, the firm will train them again”. [P1]

“The university community is churning out quality students for the audit profession, at this point, I would encourage them to continue their decent work but do not think any reform is required at this moment”. [P3]

“The audit firms are capable of providing training to their staff to operate and work in an AI environment, therefore there is no need to include those training in the academic curriculum”. [P5]

Participants 2, 4, 6,7, and 8 said there is a need for some reform in the education curriculum of the universities to better prepare the students for the world of work.

“Two components that could be added to the university curriculum are the basics of understanding software, how it communicates and how to work with large amounts of data and analysis. Secondly more focus on providing the tools for self-leadership”. [P2]

“We are in the era of digitalization and IT. Therefore, the educational curriculum should be designed to equip the students with relevant skills. They should be made to have some practical experience on how to use some of these tools and not only the learning the theories”. [P4]

“Inclusion of data analysis tools in the curriculum for the students to have both theoretical and practical first-hand knowledge before entering the job market”. [P6]

“The auditing education should focus on IT in audit because it is the present and future of auditing”. [P7]

“There should be practical sessions where students can sharpen their abilities in AI and data analysis tools while in School”. [P8]

4.3. Audit Process

Auditing is complicated and sensitive, and therefore a lot of work must be done to ensure that the output of the audit work is within the prescribed standards. PwC (2013, P. 8) identified five (5) key stages of the audit process. These include planning, risk assessment, audit strategy and plan, evidence gathering, and finalization. The growing use of AI in auditing is thereby expected to have an impact on the traditional audit process, although the extent of such an impact is somehow unclear.

The researchers, therefore, asked questions to enable them to assess the impact of AI on the audit process. Participants were asked about how AI helps them to understand the client's business operating environment. The responses to this question suggested that AI clarifies the client's business environment.

“It can be quickly used to transform data into presentations, diagrams, and analyses to make meaning of the business environment. AI can offer comprehensible and automated advice on future actions and can help the auditor in the role of advisor. The analysis of AI is more detailed than paper samples manually presented or analyzed never can produce.” [P2]

“AI is helpful to scan the business environment of the clients faster and helps to compare the performance to the industry standards and practices and expected indicators and also identify red flags for further analysis.” [P4]

“AI can compare the activities, control, and processes of the business and the industry to the industry average to better understand the operations of the client.” [P5]

“It helps us in quickly identifying patterns over a period of time, thereby making it easier to identify discrepancies.” [P6]

“Huge data for several periods can be processed, and analyzed, and this makes it easier to understand the clients operating environment.” [P7]

Participants were also asked whether AI aids in gathering accurate data and audit evidence. The consensus from the responses was that AI has helped in gathering accurate data and audit evidence. Some of the responses were:

“It provides the tools to analyze all data, not just sampling. In sampling, the sample is not necessarily interesting from an audit point of view. Data analysis highlights patterns, deviations, which will require looking into and putting the focus on outliers (sampling might never have brought this to light).” [P2]

“AI made it possible for auditors to examine the entire population of documents and data in the client's business, this helps in easy identification of frauds and errors in the books and accounts presented by management.” [P3]

“It (AI) is able to help auditors to check all transactions of the clients and therefore help to detect any form of errors, misstatements, and frauds.” [P5]

“AI is able to help us in analyzing huge volumes of data and sort it thereby making it easy for us to extract the relevant evidence.” [P7]

“AI can analyze the entire data set from the client. This has solved the problem of using sampling to test the reliability of data. Because of this, the information revealed by AI makes audit evidence accurate.” [P8]

Participants were also asked for their general assessment of the impact of AI on the audit process. Whilst the majority concluded that AI has transformed the audit process and made it more efficient, a few also were concerned about the inherent risks that AI poses to the audit process and the need therefore to be aware of and concerned about such risks and put in place measures to curtail any negative impact it might have.

“The audit process becomes more automated, and therefore makes it clear that the time of manually sifting through papers is over. Providing insights into numbers and working with people are the most relevant accountant traits of tomorrow.” [P1]

“With AI expected to introduce new risks, enhanced risk appreciation is required to mitigate any foreseeable negative impact that AI might have on the audit process.” [P3]

“It has improved the time spent on audit processes and procedures. It has also greatly increased the accuracy of the data collected, reduced audit oversights errors and frauds of the client's staff.” [P4]

“It helps in the effective and efficient conduct of an audit. It also helps to identify internal controls' strengths and weaknesses in the client's business. This insight can better position the auditor to advise the client on which aspects of their internal controls need to be strengthened.” [P5]

“AI has improved the audit process and cut down on time spent.” [P6]

“AI has simplified the audit process, and the auditor can now focus on the most important things.” [P7]

“It helps to scan enormous amounts of data, thereby saving time and money. We can now focus on making meaning from the information the AI system provides, instead of when we had to sort, and process these huge data on our own.” [P8]

4.4. Audit quality

The work of the auditor has become integral to the continuous growth of all businesses over the world. Stakeholders rely on the auditor's report to make various decisions. It is therefore imperative that the work of the auditor is of a superior quality. Audit quality has been defined by DeAngelo (1981, p.186) as the ability of auditors to discover accounting and regulatory breaches and report the breaches for the attention of all stakeholders. The auditor is therefore expected to plan and conduct his audit in such a way that all forms of

breaches, fraud, errors, etc., will be revealed. Auditors are now relying on technology and technological tools like AI to help them achieve quality work.

The researcher therefore asked questions to gather data about the impact of AI on the quality of audit work. When participants were asked how AI helps in the identification of risks, misstatements, and fraud, the following are some of the response's received:

“It identifies outliers, patterns etc. which highlight misstatements, fraud etc. It therefore makes it easy to identify areas that need more testing and crosschecking” [P2]

“AI is able to red flag any unexpected transactions which then allow auditors to spend more time to investigate those activities”. [P4]

“It helps to prompt auditors of any unusual transactions for further investigation to discover any suspected fraud or misstatement”. [P5]

“AI identifies patterns based on which anomalies can be easily flagged for further investigations”. [P6]

“Because all data are analyzed, the possibility of missing risks and fraud is almost eliminated”. [P7]

“It helps to identify inconsistencies in complex data, highlighting the aspects of the data that need to be looked into more critically, therefore the possibility of misstatements and fraud are reduced to minimum”. [P8]

Participants were also asked to comment on how AI is increasing the reliability of audit reports. Most participants agreed that AI has positively affected the reliability of audit reports.

“The audit will have processed more audit evidence at the same time, hence making the report more reliable”. [P1]

“I do not expect it to change the reliability of audit reports significantly now. However, as the technology develops further and more audit firms and clients integrate it in their systems, it will provide reliability in the reports”. [P3]

“As AI can examine the entire documents, red flag unexpected transactions, detect errors and frauds, stakeholders are much hopeful of the reliability of the reports produced by auditors”. [P4]

“AI effectively examines all documents of the clients and therefore helps to produce audit reports that are of high quality increasing the reliability of users”. [P5]

“With AI, the possibility of generating reliable audit reports has been enhanced. This is because we do not now have to sample transactions to test, but we can test all the transactions in a brief time, therefore the reports we produce now can be more reliable than the reports made using sampling” [P6]

“Audit reports are now more reliable because every data is considered and analyzed before the reports are made. This was previously not possible because we did not have the technology, time, or other resources to test each transaction”. [P7]

“AI provides a basis for accurate decision making since the results are accurate and reliable if the right data is provided”. [P8]

Participants were also asked to share their opinion on how AI is improving audit quality in totality. Participants responses are below:

“If the data provided by the client is not comprised, the use of AI technologies in analyzing and processing such data will improve the quality of the audit, however, if the data is comprised, the use of AI will not help in ensuring a quality audit. The quality of the audit begins from quality data, and this must be secured. [P2]

“AI is performing more of the repetitive tasks more effectively and efficiently and this allows auditors more time to do critical thinking, analysis and decision making to improve on the quality of audit reports to management”. [P4]

“AI prompt auditors of any risky areas in the client's business for further works, it produces relevant reports for auditors to perform better analysis and make better decisions, and so the audit quality increases”. [P5]

“Because huge volumes of data can be analyzed, the audit quality has improved”. [P6]

“AI has helped to improve the quality of audit because the fear of missing errors, fraud, misstatements are almost eliminated”. [P7]

“There are millions of transactions that the auditor cannot manually test, hence using AI gives the auditor the opportunity to test all the transactions, and this can improve the quality of the audit.” [P8]

5.0. ANALYSIS AND DISCUSSION

This chapter analyzes the empirical data collected through semi-structured interview conducted. The data collected is compared with theories and the analysis follows template approach as noted in the methodology. The outline of this chapter is geared towards answering the research questions.

5.1. Skills and Competences

5.1.1. Skill set to perform audit using Artificial Intelligence

Artificial intelligence as a disruptive technology has had an immense impact on how audits are being conducted. It is expected that this impact will continue to influence the auditing profession. AI is impacting the skills and competencies of auditors as it continues to disrupt how audits are conducted. According to Issa et al. (2016, p. 11) the use of AI in auditing will disrupt the skill sets of auditors, as the current skills will become inefficient and therefore the need for training to learn various AI applications. This position had been confirmed by the participants that the most relevant skills of auditors to work effectively in an AI environment are IT skills, problem-solving, decision-making, analytical, and critical skills. These are the skills that are beyond the capabilities of AI. The opinion of the participants is consistent with Institute for the Future (2011, p. 13) which stated that for auditors to remain relevant, they should focus on acquiring skills and competencies such as innovation, critical thinking, insight, analysis, and judgment. This is because these are skills that cannot be coded easily and therefore auditors could take advantage of them and remain relevant.

The observation of the participants is also in line with the Institute of Chartered Accountants of Scotland (ICAS) and Financial Reporting Council (FRC) (2016, p. 9) assertion that auditors need key skills such as business acumen, soft skills, technology, and data interrogation skills to be effective and remain relevant in this emerging advanced technological environment. One participant said that in today's business and auditing environment, auditors are expected to be conversant with social and cultural norms. This is also consistent with two of the ten skills and competencies that Institutes of the Future (2011, p.13) came up with which are cross-cultural competency and social intelligence.

Based on the findings above, it is evident that auditors need to acquire skills beyond the capabilities of AI for them to remain relevant in this emerging AI environment. With this skill set auditors will be able to conduct audits effectively and efficiently in an AI environment. AI could then be seen as a technology to aid the auditing profession. These skills include problem-solving, analysis, critical thinking, judgment, and innovation.

The auditing firms have seen the relevance of equipping their staff with the relevant skills and therefore periodically organize training programs needed to enhance their professional work. All the participants interviewed confirmed that their audit firms have been organizing training programs for them anytime there is a change in accounting standards, policies, procedures, and technological evolution. The training programs were intended to help improve the skills and competencies of the auditors to increase their productivity. To operate effectively in an AI environment, all the participants pointed out that auditors required IT skills and that their audit firms had trained and always trained newly recruited auditors. The training is important to know how to conduct audits in AI, retrieve data, and analyze the results. However, one participant stated that even though

all the engagement team members have been trained, they sometimes request technical support from the IT department. They sometimes include staff with a good IT background on some engagements that require more specialized skills in IT.

5.1.2. Potential threats and opportunities to auditors

AI in audit is an emerging disruption technology. The exact effect of this technology is not yet known as it is still in the initial stages. The technology will in no doubt disrupt how audit is conducted and the skill sets required of auditors. However, researchers are divided on the extent of the effects on auditors, while some have suggested that it would enhance the work of auditors, others think it could lead to job losses. According to Issa et al. (2016, p. 14) AI can either assist or replace humans, there are some tasks such as tax preparation that can be automated to increase productivity but difficult to automate cognitive non-routine tasks. This position was again affirmed by Ozlanski et al. (2020, p. 77) that technology creates both challenges and opportunities, therefore, it is important for auditors to understand the evolution of the profession to take advantage of the opportunities.

According to Kokina & Davenport (2017, p. 119) the skills of auditing staff are likely to be affected by AI in the future regarding reduction in entry-level jobs. All the participants interviewed believed that AI would affect the skills and competencies of auditors. This will therefore require human auditors to acquire skills and competencies that are beyond the capabilities of AI. However, all the participants disagree that AI will lead to job losses. One of the participants said, AI can perform more repetitive tasks, therefore, the skill set that may be required of auditors in the future will be more of problem-solving and decision making but do not think it could lead to job losses.

AI in auditing comes with a lot more opportunities both for auditors and the auditing profession. AI can extract relevant information from accounting data aiding auditors to spend more time on areas that require high-level judgment (Kokina & Davenport, 2017, p. 117). AI is expected to perform complementary to many audit functions increasing the competencies and effectiveness of the assurance services provided by auditors (Issa et al., 2016, p. 5). The participants interviewed said AI in auditing is a blessing as it helps to enhance the skills and competencies of auditors to spend more time on improving decision making and delivering better services to their audit clients. The responses of the participants match the argument made by Issa et al. (2016, p. 9) that auditors will be able to focus on high-value tasks instead of wasting time on repetitive tasks that can be done by AI and focus on the interpretation of results putting the professional skills of auditors to a better use.

Based on the findings above, it is evident that AI will disrupt the skills and competencies of auditors, posing some threats and opportunities. Auditors need to critically assess these threats and opportunities to position themselves to respond appropriately. Therefore, auditors must equip themselves with the relevant skills and competencies to continue to remain relevant. The skill set needed are analytical skills, data visualization, IT, problem-solving skills, and decision-making. It means that relevance should be placed on these skills rather than computational skills, repetitive tasks and tasks that can easily be automated like calculation of depreciation, monthly interest on loan or investment, and generating financial statements for auditors to remain relevant in the profession.

5.1.3. Redesigning the academic curriculum

The participants interviewed have divergent views on redesigning the academic curriculum to include AI tools. Though they all agreed that these tools are relevant for the profession but are not currently part of the curriculum. The observation of the participants is in conformity with the findings of Early (2015, p. 499) that academia has not incorporated advanced technology in the curriculum to better prepare students for the world of work. Therefore, some of the participants recommended that the educational curriculum should be redesigned to equip the students with AI tools for them to have some practical experience on how to use some of these tools before entering the job market. They argued that it will increase the employability of the students and give them added advantage over their peers without those skills. The participants interviewed did not advocate for a total overhaul of the academic curriculum but suggested an introduction of courses in the use of AI tools and data analysis. This aligned with the findings of Early (2015, p. 499) that school curricula only need to introduce changes in technology but not a total overhaul. A participant went further to praise the academia for churning out quality students and encouraged them to continue their excellent work.

However, some of the participants are of the opinion that school curricula do not need any revision to include AI tools. They argued that the auditing firms train all their newly recruited staff and all old staff on any recent changes or newly introduced technological tools. This group of participants argued that the auditing firms do not use the same tools. Therefore, even if AI tools are included in the curriculum, the audit firm will again train the employees. *“The audit firms are capable of providing training to their staff to operate and work in an AI environment, therefore there is no need to include those training in the academic curriculum”* (P5).

Based on the findings gathered from the participants, there are divergent views on the revision of school curricula. Three of the eight participants believed that there is no need to revise the curriculum while five argued for introducing AI tools. As academia is a major stakeholder in preparing students for the world of work, it is important to take a second look at the technological needs of the auditing profession.

5.2. Audit Process

Auditing involves a systematic process of gathering information on the activities and operations of a company and communicating the results to all interested parties. Technology is impacting on the approach and conduct of audits. According to Bierstaker et al. (2001, p. 159) technology is transforming the audit process by removing traditional audit files which rely on paper documentation and working papers. AI as a disruptive technology is expected to cause further changes to the audit process.

5.2.1. Contribution of AI to understanding business environment

As the business environment is evolving and becoming complex, it poses business risks, it is important for auditors to continue to have a better understanding of the client's environment throughout the audit process (Messier et al., 2008, p. 75). For this reason, the participants were asked how AI helps in understanding the client's business environment. All the participants agreed that AI had contributed to a better understanding of the client's business environment as it makes it possible for faster scanning, accurate monitoring, and comparison with the industry average for accurate decision making. The

observation of the participants interviewed are aligned with the positions of Kokina & Davenport (2017, p. 119) and Adiloglu & Gungor (2019, p. 209) that AI contributes to a broader and deeper understanding of the client's business to increase audit efficiency and quality. The participants went on to say that AI made it possible to quickly process large amounts of data of the client's business. *"Huge data for several periods can be processed, and analyzed, and this makes it easier to understand the clients operating environment"* (P7).

Based on the findings above, all the participants agreed that the business environment is becoming complex with a lot of inherent business risk. However, AI helps to easily scan the business environment faster and more accurately than humans. Therefore, it is important for auditors to make use of AI for a better understanding of the business environment of clients to increase audit efficiency and quality.

5.2.2. Risk Assessment Potentials of AI

Risk assessment is an essential element of the audit process. It involves identifying and assessing risks that could lead to material misstatements in the financial statements. Therefore, to assess the impact of AI in the risk assessment process, the researchers asked the participants questions in that regard. The participants stated that AI had been identified as a good risk assessment tool. To them, AI helps to identify unexpected transactions and discrepancies for further investigation. The observation of the participants again aligned with the argument of Crosley & Anderson (2018, p. 5) that AI analyzes and draws conclusions while identifying notable outlier transactions that require closer review. This position was affirmed by Kokina & Davenport (2017, p. 117) where they stated that AI helps in identifying and assessing the risks of the business and industry. *"It helps us in quickly identifying patterns over a period, thereby making it easier to identify discrepancies"* (P6).

The finding shows that AI tools are helpful in easy identification and assessment of potential risks and discrepancies in the accounts presented by management. The use of AI reduces material misstatements in financial statements as it brings them to the attention of auditors. With these, the time of auditors could be used more judiciously for more detailed investigation and analysis of the risks identified for better decision making.

5.2.3. AI as a data gathering and audit evidence tool

In conducting audits, auditors need to have a detailed plan and adopt strategies for proper execution of the audit engagement. These include activities such as nature, timing, and extent of risk assessment and audit procedures to be performed to conduct an effective and efficient audit (Messier et al., 2008, p. 155). The gathering of audit evidence is crucial in the audit process as it helps to test the internal controls of the client business, trace the amount and disclosures in the financial statement and obtain confirmation from third parties on the accuracy and completeness of amounts in the client's books (PwC, 2013, p. 8).

All the participants interviewed attest to the fact that AI had changed the audit strategy over the years. According to them, with the introduction of AI in audits, less time is now being spent on drafting the audit strategy and audit procedures to adopt. *"It has improved the time spent on audit processes and procedures. It has also greatly increased the accuracy of the data collected, reduced audit oversight errors and frauds of the client's"*

staff” (P4). The participants interviewed said that AI helps to gather accurate audit evidence on the entire population of the client’s book of accounts. One participant said, *“AI made it possible for auditors to examine the entire population of documents and data in the client's business, these help in easy identification of frauds and errors in the books and accounts presented by management”* (P3). The observation of the participants supports the findings of previous researchers arguing that AI makes it possible to examine the entire population of accounting transactions (Kokina & Davenport, 2017, p. 119) and improved the chance of detecting misstatements and frauds (Adiloglu & Gungor 2019, p. 209). Issa et al. (2016, p. 10) affirmed this position by arguing that AI helps in gathering complete audit evidence decreasing the probability of fraudulent activities, manipulation, and misstatements of accounting information eluding the attention of auditors.

The findings show that AI has played a significant role in accurate data gathering as it has become possible to examine all transactions and books of the clients. These provide adequate, more effective, and efficient audit evidence than the use of sampling in auditing that had been the case before the introduction of AI in auditing.

5.2.4. General impact of AI on audit process

Participants were also asked for their general assessment of the impact of AI on the audit process. Even though all the participants agreed that AI had transformed the audit process and made it more effective and efficient, some have concern about the inherent risk that AI might pose to the audit process.

According to the participants, AI has contributed to strengthening the internal controls in the clients’ businesses. *“It helps in the effective and efficient conduct of an audit. It also helps to identify internal control strengths and weaknesses in the client's business. This insight can better position the auditor to advise the client on which aspects of their internal controls need to be strengthened”* (P5). They also argued that AI has simplified the audit process *“The audit process becomes more automated, and therefore making the time of manually sifting through papers is over”* (P1) and given auditors enough time to spend on other issues *“We can now focus on making meaning from the information the AI system provides, instead of when we had to sort and process huge data on our own”* (P8).

However, there are concerns that AI, though having enormous benefits to auditors and the auditing profession could pose some threats to the audit process *“AI is expected to introduce new risks, therefore, enhanced risk appreciation is required to mitigate any foreseeable negative impact that AI might have on the audit process”* (P3).

Based on the findings above, the participants noted that AI has had an enormous impact on the audit process by strengthening the internal controls, simplifying the process through automation, reduction of errors and misstatements, and better knowledge of the client's business, etc. However, the concern is that AI could bring some inherent risks, it is, therefore, important for a periodic review and auditing of the audit process to test if the intended outcomes are being produced.

5.3. Audit quality

The product of the audit process is the audit report and the relevance or otherwise of the audit report can be assessed by the quality of the audit. Knechel (2016, p. 215) affirms that one of the major challenges that have plagued the audit profession had to do with the quality of the audit. The introduction of AI into auditing is expected to improve the quality of audits. According to the IAASB (2014, p. 5), the quality of audit can be assessed using a framework which comprises of inputs, processes, and output. The interactions of these key components determine the quality of an audit work. In designing our interview guide, the researchers, being mindful of these components of audit quality asked questions which will enable us to gather enough information about how AI had impacted audit quality.

5.3.1. Potential of AI to help identify risks, misstatements, and fraud

In our bid to help establish the impact of AI on audit quality, participants were asked if AI helps in the identification of risks, misstatements, and fraud. The quality of an audit hugely hinges on the less likelihood of it (audit report) containing unidentified risks, misstatements, and fraud. AI can extract relevant information from accounting data aiding auditors to spend more time on areas that require high-level judgment to increase audit quality (Kokina & Davenport, 2017, p. 117).

Participants agreed that AI has helped significantly in identifying risks, misstatements, and fraud. Participants attributed this to the ability of AI to process and analyze entire data sets, drawing patterns and flagging irregular transactions which auditors can further test. According to P8, *“It helps to identify inconsistencies in complex data, highlighting the aspects of the data that need to be looked into more critically, therefore, the possibility of misstatements and fraud are reduced to a minimum”*. This point is reemphasized by P2 who argues that *“it identifies outliers, patterns etc. which highlight misstatements, fraud etc. It therefore makes it easier to identify areas that need more testing and crosschecking”*

According to participants, this was not possible without AI because auditors did not have the resources and time to test all the data, thereby relying on sampling. This increased the possibility of errors, fraud, and misstatements going undetected. *“AI made it possible for auditors to examine the entire population of documents and data in the client's business, this helps in easy identification of frauds and errors in the books and accounts presented by management” [P3]*. P5 also adds that *“it (AI) is able to help auditors to check all transactions of the clients and therefore help to detect any form of errors, misstatements, and frauds.”* These observations of the participants are aligned with the position of Issa et al. (2016, p. 10) that the use of AI in auditing would decrease the probability of fraudulent activities, manipulation, and misstatements of accounting information eluding the attention of auditors, thereby increasing the quality of the audit.

The findings show that AI has played a significant role in risk identification, misstatement of accounting information, and fraud detection in the books of clients. This has increased the quality of audit reports. Therefore, it is important for auditors to make use of AI in their audit engagement to help detect errors, flag out risky areas of the client business, any misstatement, and frauds that might be perpetrated to improve audit quality.

5.3.2. Potential of AI in increasing reliability of audit report

Another aspect of audit quality lies in how reliable the audit report is. Reliability is measured in terms of how much premium can be placed on the report to make decisions. The time taken to prepare and submit the report also affects its reliability. The researchers, therefore, asked the participants to assess the impact of AI on the reliability of audit quality.

Most of the participants were of the view that AI has positively impacted and improved the reliability of audit reports. One participant had this to say *“with AI, the possibility of generating reliable audit reports has been enhanced. This is because we do not have to sample transactions to test, but we can test all the transactions in a brief time, therefore, the reports we produce now are more reliable than the reports made using sampling”* (P6). A similar sentiment was expressed by another participant thus: *“Audit reports are now more reliable because every data is considered and analyzed before the reports are made. This was previously not possible because we did not have the technology, time, or other resources to test each transaction”* (P7). These findings have the same position as Kokina & Davenport (2017, p. 119) that AI makes it possible to examine the entire population of accounting transactions increasing the reliability of audit reports.

However, another participant believed it was too early to make a categorical conclusion about the effect that AI has positively impacted and improved the reliability of audit report. He was cautioned that it was too early, and that the technology will need to develop further for both audit firms and businesses to introduce AI into their operations, then the reliability can be assessed. *“I do not expect it to change the reliability of audit reports significantly now. However, as the technology develops further and more audit firms and clients integrate it in their systems, it will provide reliability in the reports”* (P3).

Based on the findings above, all the participants agreed that AI will eventually increase the reliability of audit reports. While some said AI is already contributing to the reliability of audit reports, others think it is too early to measure but expected to impact reliability in the future. Therefore, it is important for auditors to consider monitoring continuously the impact of AI on the reliability of the audit reports.

5.3.3. General Impact of AI on audit quality

Finally, participants were asked to make a general assessment of the impact of AI on audit quality. There was a consensus from the participants that AI has helped to improve audit quality. P4 is of the view that AI has freed the auditor's time by *“..... performing more of the repetitive tasks more effectively and efficiently, and this allows auditors more time to do critical thinking, analysis, and decision making to improve the quality of audit reports to management”*. This is consistent with the finding of Kokina & Davenport (2017, p. 117) that suggest that AI technologies give auditors the room to focus on more analytical aspects of the audit, by taking out some repetitive tasks. P5 also emphasized that *“AI prompts auditors of any risky areas in the client's business for further work. It produces relevant reports for auditors to perform better analysis and make better decisions and so the audit quality increases”*. This observation is again aligned with the argument of Crosley & Anderson (2018, p. 5) that AI analyzes and draws conclusions while identifying notable outlier transactions that require closer review.

However, there are concerns about the integrity of the data. If the data is compromised, the AI technology may not be able to detect this, and the quality of the audit will therefore be impacted negatively. Therefore, the focus should not be on only the output, but measures must be put in place to safeguard data at the entry points. *“If the data provided by the client is not compromised, the use of AI technologies in analyzing and processing such data will improve the quality of the audit, however, if the data is compromised, the use of AI will not help in ensuring a quality audit. The quality of the audit begins from quality data, and this must be secured (P2).*

To conclude, the findings suggest that AI has contributed to increasing audit quality. It has played significant roles in risk identification, misstatement of accounting information, and fraud detection in the books of clients. Additionally, it has increased the reliability of audit reports because it is now possible to examine every accounting transaction and allows auditors enough time to focus on analysis, critical thinking, and decision making as repetitive and more routine works are automated.

6.0. CONCLUSION

This is the concluding chapter of the research work. It focuses on the key lessons, takeaways, and provides answers to the research questions. The contributions of research to existing literature, theoretical, practical, and social contributions of the research were discussed. The chapter further discusses the limitations of the research and provides suggested areas for further research. The chapter ends with discussions on the quality criteria and ethical considerations of the research.

6.1. General Conclusion

Since the beginning of civilization, societies, businesses, and individuals have had to adapt to new tools, implements, and technologies to forge better systems and ways of achieving optimum output with as little effort and resources as possible. From the stage era, through to the industrial revolution, to the technological revolution, society, businesses, and individuals are constantly investing in new means to make life better and easier. Such innovations that topple already existing ones are referred to as *disruptive innovations or technologies*. One of such innovations which is currently reshaping how society and businesses in general operate and function is AI.

The focus of this study, therefore, was to assess the impact of AI as a disruptive technology on auditors' skills and competencies, audit process, and audit quality. The study found that the highly needed skills and competencies required for auditors to function effectively in an AI environment are IT skills, problem-solving, decision-making, analytical, and critical skills. The study also found that academic curricula need to be streamlined to include the acquisition of these skills to produce auditors who will be abreast with the demands of the modern business environment. Others, however, are of the opinion that audit firms always train and retrain their staff on any modern technology or tool that may impact their work so there is no need for curricular to be changed to include such tools.

In addition, the findings of the study confirm that AI has played a significant role in the audit process. Participants confirmed that AI has helped them to better understand the client's business environment, as huge volumes of data are easily and quickly scanned for further processing and analysis. Again, AI has helped in risk assessment, fraud, and detection of errors. Concerns were raised also about the possibility of AI introducing new forms of unforeseeable risks, and auditors will need to have a high sense of risk appreciation to anticipate and mitigate such risks.

Furthermore, the findings of this study established that AI has contributed to increasing audit quality. It has played significant roles in risk identification, misstatement of accounting information, and fraud detection in the books of clients. Additionally, it has increased the reliability of audit reports because it is now possible to examine every accounting transaction and allow auditors enough time to focus on analysis, critical thinking, and decision making as repetitive and more routine works are automated. The major issue of contention which needs to be addressed to guarantee audit quality has to do with the integrity of the data and its sources. Once the data is secured, AI will help to ensure that the audit work is of excellent quality.

6.2. Contribution and Implications

6.2.1. Theoretical Contributions

AI is changing the face of business worldwide. Though the concept is not new, it has taken quite some time for it to be accepted and inculcated in business processes. This is consistent with the disruptive innovation theory proposed by Christensen and Bowler. The technology, although still in its growth phase, has received massive patronage, especially in the manufacturing sector. This research theoretically contributes to the growing AI literature with a specific focus on audits in Sweden.

Based on the findings discussed in the previous chapter, it is evident that AI will disrupt the skills and competencies of auditors, posing some threats and opportunities. Auditors need to critically assess these threats and opportunities to position themselves to respond appropriately. Therefore, auditors must equip themselves with relevant skills and competencies to continue to remain relevant. The skills set needed are analytical skills, data visualization, IT, problem-solving skills, and decision-making. This has become necessary because businesses are now able to generate huge volumes of data that need to be analyzed, patterns identified, and decisions and strategies made which will help create value for the business. The human auditor does not have the competence and resources to undertake such ventures. AI technologies on the other hand have become ‘fashionable’ now because they possess the ability to undertake complex computations and identify patterns and relationships within short periods. AI technologies have reached this capacity because of the availability of huge volumes of data, increased computational power, and the availability of hardware. AI has therefore become a particularly important complement to the work of the auditors, enabling them to focus on critical issues pertaining to the audit, and this accounted for the reason auditors now perceive acquiring IT, problem-solving, and analytical skills as the most important to the effectiveness of their audit.

Based on the findings pertaining to the impact of AI on the audit process, the conclusion arrived indicated, that there has been an enormous impact of AI on the audit process. This is evidenced by the strengthening of internal controls, simplification of the process through automation, reduction of errors and misstatements, and better knowledge of the client's business, etc. This has happened because human auditors did not have the capacity to process and analyze all the data sets, and therefore, had to resort to sampling to gather audit evidence and form their opinion. The possibility of missing misstatements, errors, and frauds are significantly high. AI has addressed this concern because the entire data set can be processed and analyzed within a brief time, with accuracy. AI technologies are also able to highlight areas of internal controls that need strengthening based on certain parameters and thresholds.

The findings on audit quality above pointed out that AI had contributed to increasing audit quality. It has helped with risk identification, reducing misstatement of accounting information, and fraud detection in the books of clients. In addition to that, it has increased the reliability of audit reports because it is now possible to examine every accounting transaction. This conclusion was arrived at because respondents are of the view that because entire data sets are processed and analyzed, it increases the probability of the audit report being free from errors, misstatements, etc. This eliminates any potential for the report to be doubted due to the auditor's personal judgement and assumptions.

6.2.2. Practical Contributions

Stakeholders can draw practical implications from the study. Managers in audit firms can rely on this study and its findings and begin to strategize on how best to include AI technologies in performing their audits. The big 4 audit firms are all in the process or have acquired custom-made AI technologies to enhance their audits. Small and medium tier firms or non-big four firms could also do the same, realizing how crucial AI is in performing audits in the current fast-changing business environment.

Furthermore, managers will be able to determine the required skills and competencies needed to perform audits in AI environments, thereby streamlining the recruitment process, and hiring staff who are fit for the purpose. This will also be crucial in designing in-house training programs to reflect the current demands of the profession. Audit clients can also leverage the findings of this study to introduce AI technologies into their business processes to enjoy the efficiencies that AI technology has on business performance.

6.2.3. Societal Implications

This study has relevance for social actors like academic institutions, accounting and audit regulatory bodies, and audit firms. The findings highlight the need for academic institutions to realign their curricula to reflect the current needs of the audit profession since many businesses are adjusting their operations to accommodate AI. This will enhance the skills and competencies of the newly trained auditors to appreciate how to conduct audits in an AI environment. Therefore, academic institutions together with audit firms and regulatory bodies must work together to structure academic curriculum that will include working in an AI environment.

Regulators in the audit and accounting industry can use these findings to draw up new policies regarding how to audit in an AI environment. This will be to appreciate how to regulate AI technologies to better serve the clients and all stakeholders. Individuals who are interested in working in auditing will find this study useful since it can provide a guide to them on current trends in the field, what skills and competencies they will require to excel in auditing and stay abreast with current trends in the profession.

6.3. Limitations

The first limitation of the research is the small number of participants used. The researchers made enough effort and contacted many auditors to participate, but it was exceedingly difficult for them to accept participation because the period from January to May 2022 during which the research was conducted is a busy season for auditors in conducting audit engagements. Secondly, the research could not include participants who are in the partner positions. Though the researchers acknowledged that auditors in the lower level may mostly use AI technology for audit assignments, partners could also provide relevant information especially on audit quality as they have more experience in the field and have the responsibility of reviewing and signing audited accounts. The researchers made efforts to reach out to partners but were unsuccessful.

Additionally, all the participants interviewed were made up of auditors from the big four firms in Sweden. This resulted in the data collected focusing on Sweden and as a result limiting the findings to pertaining to only Sweden. Therefore, generalization of the result is not possible.

6.4. Future Research

AI is an emerging technology, it has therefore a lot of research potential in business administration. There are a lot of research areas that are either unresearched or require more research work to increase knowledge. Firstly, further research should be conducted on this topic with a lot more participants and include participants in top management positions, particularly audit partners. This would give more holistic and complete findings of the research questions. Secondly, the research should be expanded to include both big four firms and non-big four firms in Sweden, other countries, sub-regions, and continents. It could be conducted using either qualitative or quantitative methods or even using mixed methods. This would provide findings on how AI is viewed and used in other jurisdictions which might make it possible for generalizing the results and further recommendations to academia and professional bodies.

Additionally, further research could be conducted from the perspectives of other stakeholders. The findings from this research were based on data collected from auditors. However, it is possible that other stakeholders like clients, investors, government, and professional bodies could have different opinions. The results could then be compared with the findings of this research for a more holistic view of the impact of AI on auditing.

As there were divergent opinions on the need to redesign the academic curriculum. Further research is required with participants from the academia and industry for a conclusive finding and further collaboration on the needed changes if the need be.

Finally, further research could be conducted on the impact of AI on other parameters in auditing such as its impact on audit efficiency, and professional judgement, among others. Research could also be conducted on the impact of AI on inventory management or its effect on management accounting in Sweden or any other country.

6.5. Quality Criteria

It is important to evaluate the quality of research work by determining the quality of data collected, how it was measured, reliability, and credibility of the research. According to Yilmaz 2013 (p. 317) qualitative and quantitative research differ in determining the criteria for evaluating the quality of research. Quantitative research uses reliability and validity for evaluating research (Yilmaz 2013 p. 317; Bryman & Bell, 2011, p. 41). Reliability refers to the degree to which a research instrument measures a given variable consistently every time under the same conditions with the same subjects (Yilmaz 2013, p. 317). It is concerned with whether the result of the research is repeatable (Bryman & Bell, 2011, p. 41). Validity refers to the accuracy of the research data, that is the measuring instrument measuring what it is supposed to measure (Yilmaz 2013 p. 318). According to Bryman & Bell (2011, p. 42) it is concerned with the integrity of the results generated from the research.

However, Denzin & Lincoln (1998, p. 51 cited by Yilmaz 2013, p. 319) argued that since qualitative research is focused on meaning and interpretation lacking generalization of result, reliability, and replicability are pointless. Yilmaz 2013 (p. 319) also argued that the theoretical assumption of qualitative research is different from quantitative research and therefore should be judged differently. Hence, Lincoln & Guba (1985 cited by Yilmaz 2013, p. 320; Bryman & Bell, 2011, p. 43) propose the use of credibility, transferability, dependability, and confirmability as criteria to vigorously assess qualitative research.

Credibility refers to the participants that took part in the research, finding the results to be true or credible (Yilmaz, 2013, p. 320). According to Bryman & Bell (2011, p. 396) credibility is about ensuring that research is carried out in accordance with good practice and thereafter submitting research findings to participants involved in the research for confirmation that the researchers understood their position or the intended meaning of the participants. According to (Saunders et al., 2007, p. 320) credibility is also achieved with the supply of all relevant information to the participants before the interview and this also gave them enough time to prepare for the interview. To achieve this, the researchers forwarded the interview guide to the participants two weeks prior to the interview. The researchers developed themes in line with the research question and listed questions to ask the participants. The researchers, in addition to the pre-listed questions, asked follow-up questions to explore the research questions and for more details from the participants (Saunders et al., 2007, p. 312). To ensure effective discussion and capturing of the data and the discussions, a note was taken by one of the researchers (Saunders et al., 2007, p. 312). To achieve the credibility of the research, data collected were sent to the participants for their assessment and confirmation that the researchers correctly captured and understood the intended meaning of the participants. Unfortunately, no response was received from the participants, and therefore the researchers concluded that everything was captured and interpreted properly as they intended.

Transferability is achieved when findings are transferable to other similar settings (Yilmaz, 2013, p. 320). That is a thick description of the setting, context, people, actions, and events studied is needed to ensure transferability (Yilmaz, 2013, p. 320; Bryman & Bell, 2011, p. 398). The researchers can conclude that full details of the research have been provided to ensure transferability. The researchers gave a full description of the research questions, the contexts, the research design, methodology, and the findings. With all these well-established, any researcher could follow the same processes and transfer the research to other settings.

Dependability is similar to reliability in quantitative research, and it is the process of selecting, justifying, and applying strategies, procedures, and methods that are clearly explained and evaluated by the researchers and confirmed by an auditor (Yilmaz, 2013, p. 320). There are also issues of both interviewee and interviewer biases in semi-structured interviews, where the interviewer attempts to impose personal beliefs on the questions being asked tilting the interviewee's responses to their beliefs (Saunders et al., 2007, p. 318). To eliminate this, the researchers drafted the research questions to be as open as possible to eliminate both biases. According to Bryman & Bell (2011, p. 398) dependability is an issue of trustworthiness, therefore, should adopt an auditing approach by keeping all records of the research such as problem formulation, selection of research participants, fieldwork notes, interview transcripts, data analysis, among others. To ensure dependability, the researchers kept all records pertaining to the research from the initial contact of participants, the research topic formulation, the interview guide drafted, and the notes on the interviews conducted.

Confirmability refers to basing the findings of the research on the analysis of the data collected with confirmation from the auditors (Yilmaz, 2013, p. 320). According to Bryman & Bell, (2011, p. 398) confirmation is concerned with the researchers showing to have acted in good faith and not allowing personal values to influence the conduct of

the research and the findings. To ensure confirmability the researchers do not allow their personal beliefs to influence the conduct of the research by allowing asking questions that are more open-ended with a follow-up question and the findings of the research are solely based on the data collected. The researchers, therefore, do not intend to generalize the results as the findings may differ from one setting to another.

6.6. Ethical Consideration

Ethics refers to the appropriate behavior of researchers in relation to the rights of participants (Saunders et al., 2007, p. 178). There are two dominant philosophical points within business and management research on ethics; these are the deontological view and the teleological view. According to the deontological view, the ends do not justify the means to use unethical ways in research while the teleological view argues that the ends served by research justify the means (Saunders et al., 2007, p. 178). The researchers had adopted deontological views and therefore conducted the research with high ethical principles in mind throughout the research process. Ethical consideration requires that researchers do not expose the participants or anybody else to any form of harm or pain. Therefore, researchers should formulate and clarify their research topic, design research, and gain access, collect data, process, and store data, analyze the data, and write the findings in moral and responsible way (Saunders et al., 2007, p. 178).

Data collection through face-to-face interviews places the researcher in a position of power for at least during the research period. Therefore, researchers should not formulate questions that will cause some discomfort to the participant (Saunders et al., 2007, p. 181). Researchers should not invade the privacy of their participants but expected to respect individual values (Bryman & Bell, 2011, p. 138). The researchers drafted the interview guides and follow-up questions so that it does not contain any sensitive and personal information to discomfort the participant. Confidentiality and anonymity are particularly important in qualitative research; therefore, researchers should make sure that the identity of participants are not exposed to any form of harm (Bryman & Bell, 2011, p. 131). In addition, the researchers forwarded the research guide to the participants two weeks prior to the interview and thereafter agreed on the day, time to conduct, and to be spent on the interview. This was done to avoid harm to the participant as harm could also be caused by the approach used by the researchers, that is when the wrong nature and timing is used which is unfavorable to the participants (Saunders et al., 2007, p. 182).

The consent of all participants should also be taken into consideration. Participants should not be pressured or forced to participate in the research as it will infringe on their rights (Saunders et al., 2007, p. 182). Therefore, researchers should acquire consent from participants through detained written agreements or entered verbally (Saunders et al., 2007, p. 184). The researchers, prior to the interview, contacted the participants for their consent to participate in the research. There is also the need for open, honest, and transparent communication of all relevant information to all interested parties (Bell & Bryman, 2007, p. 71). According to Bryman & Bell, 2011, p. 133) the principle of consent requires that participants should be given all information needed to help them make informed decisions on whether to participate in the research. The researchers made the participants understand the purpose of the research to be only for academic purposes and this gave them the confidence to give their consent. The researchers further ensured that the purpose communicated was factual and truthful in order not to fall victim to deception.

This is important because according to Bryman & Bell, 2011, p. 138) deception occurs when researchers represent their research as something else other than what it is.

Ethical issues are also about interpreting and representing the data collected honestly; that is analyzing and reporting data correctly placing a great deal of trust in the integrity of researchers (Saunders et al., 2007, p. 192). This position is affirmed by Bell & Bryman (2007, p. 71) researchers should avoid misleading, misunderstanding, misrepresenting, and false reporting of research findings.

In conclusion, this research was conducted with honesty, openness, and transparency. The information contained in the research cannot be traced to any participant. Additionally, the conduct of the research did not cause any harm to the participants and is not expected to harm any participant in the future. In all, the research was conducted with strict adherence to the ethical requirements of USBE.

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8. Appendix

8.1. Appendix 1: Email to interview participants

To Whom it May Concern

We are students of Umeå university pursuing a master's degree in accounting. As part of our academic work, we must present a 30-credit thesis on a relevant topic based on our curriculum. The world is undergoing massive revolutions, and this is mostly fueled by technology. We realize technology has changed and keeps changing every aspect of life, especially the way and tools we use to work. With this notion in mind, we set out to study the impact of Artificial Intelligence (AI) on auditors' skills and competence, audit process, and audit quality.

The research will be conducted using interviews to collect relevant data. Before the interview, we will send you the interview guide between 28th to 30th April 2022. The interview guide will outline the specific areas of our research questions and each area will have a set of questions under them. We would like to have the interview between 13th April to 29th April 2022 due to the limited time we have at our disposal. We would therefore be grateful if you could choose any day within the period. We would like to conduct the interview online using any of the video conferencing platforms convenient to you and it will be conducted in English. The interview process will take between 35 to 45 minutes. The interview process shall not be video or audio-recorded, but we will take written notes of the discussions.

Please be assured that the interview is entirely anonymous and will not be traced to you. Data and conclusions drawn will also be aggregated and reported as a whole, and not as parts. Any information gathered will also be used for only the purpose for which it is given (academic purpose) and will not be used in any other way. Your participation in the interview is voluntary and you have the right to withdraw at any time.

We look forward to your participation and contributions to help us research the impact of Artificial intelligence on auditing. We kindly await your response.

Yours sincerely,

David Klutse Yebi & Edwin Kenneth Cudjoe

8.2. Appendix 2: Interview guide

Background Questions

1. How long have you been working in the auditing field?
2. What is your current position in the firm?
3. What is your highest educational qualification?
4. Which form (type) of Artificial Intelligence (AI) technologies have you ever used or currently using?

Skills and Competencies

1. In your opinion, will AI replace auditors or complement auditors? Please explain.
2. In your opinion, what will be the effect of AI on the skills and competencies of auditors?
3. What will be the most relevant skills for the next generation of auditors to operate in an AI environment?
4. What kind of training programs do auditors need to operate in an AI environment effectively and efficiently?
5. What changes do you propose to academic curricula to prepare the next generation of auditors?

Audit Process

1. How does AI help to better understand the client's business and environment?
2. How does AI help in evidence gathering and accuracy of data collection?
3. In your opinion what is the impact of AI on the audit process?

Audit Quality

1. How does AI help to identify risks, misstatement, and fraud?
2. How is AI increasing the reliability of audit reports?
3. In your opinion, how is AI improving audit quality?

8.3. Appendix 3: Information Sheet Background

We expressed our heartfelt gratitude to you for your acceptance to participate in the research. In this research, we will investigate the impact of Artificial Intelligence on auditors' skills and competencies, audit process, and audit quality. Attached to this information sheet is the interview guide stating the questions to be asked in the interview. In addition, to the questions stated, a follow-up question could be asked for better understanding. For your information, the participant of the research is made of auditors in the big four firms in Sweden.

Participation

The interview will be conducted between 13th April to 29th April 2022 online using the agreed video conferencing platform in English. The interview process will take between 35 to 45 minutes. The interview process shall not be video or audio-recorded, but we will take written notes of the discussions as agreed.

Confidentiality and Use of Data collected

Be assured that the anonymity of all participants shall not be compromised. Your identity and that of your firm shall not be disclosed to any person other than the supervisor if the need be with your permission.

The researchers shall use direct quotations of the participants but without linking them to your names. Code will be assigned to your names; this will make it impossible to be traced to you. A copy of the discussion will be sent to each participant for review before being incorporated into the final report.

To conclude, you have the right to withdraw your consent at any time during the process. Thank you once again for your acceptance to be part of the research process.

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