



AI in Audit and Dealmaking

A Guide Tailored for PwC Cyprus

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BACHELOR'S THESIS

July 2024

Bachelor's Degree Programme in International Business
Option of Accounting and Finance

ABSTRACT

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Tampere University of Applied Sciences
Bachelor's Degree Programme in International Business
Accounting and Finance

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AI in Audit and Dealmaking

Bachelor's thesis 50 pages, appendices 1 page
July 2024

This report provides an in-depth exploration of the integration of artificial intelligence in audit practices, with a specific focus on PwC Cyprus, the commissioner. The introduction sets the stage by outlining the commissioner's role and the purpose, as well as the significance of this research. The methodology section elucidates the research question and delineates the research methods employed, alongside the data analysis methods utilised. A comprehensive theoretical framework is presented, delving into the concepts of audit, artificial intelligence, and machine learning, and their interpretation and incorporation in audit contexts.

What is more, key opportunities and risks associated with AI integration are highlighted. The case study of PwC Cyprus aims to understand audit processes after analysing their current technological integration, concerns, and implications. Interview findings provide insights into the perspectives of employees, emphasising their needs and expectations. The dissertation ultimately offers an AI integration strategy and guide, outlining strategies, challenges and practical recommendations on how to successfully incorporate AI into audit engagements to increase operational efficiency.

Keywords: artificial intelligence, audit, PwC Cyprus, strategic plan

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1 INTRODUCTION

This practice-based dissertation delves into the landscape of audit and artificial intelligence as well as their correlation in this High-tech era. PwC Cyprus serves as the commissioner of this study to further support and enrich the findings of the author. Throughout the report, key challenges and concerns of employees within the audit department have been identified, and eventually, proposals for practical recommendations on how AI could be incorporated into audit engagements to address such implications are given. These notions are discussed in terms of academic research, observation, document analysis, and interviews conducted with current employees. The overall intended result of this research is to give an understanding of artificial intelligence and how it forms the future of auditors and operational efficiency.

2 OVERVIEW OF THE TOPIC

This research examines the application of Artificial Intelligence (AI) within the operational frameworks of audit procedures and dealmaking. The author aims to investigate how could AI be incorporated into existing workflows without jeopardising established client relationships or causing disruptions to current business operations. The thesis emphasises on understanding and addressing potential risks linked to the adoption of AI-driven technologies within the professional services industry.

2.1 Commissioner

Price Waterhouse Coopers (PwC) is a globally known company for its exceptional corporate accounting services, compliance and regulatory services, risk management and various other operations that are aligned with the financial landscape's standards.

"Our purpose is to build trust in society and solve important problems." is the mission and strategic purpose of the organisation. (PwC n.d.) In this constantly evolving world, where changes and market disruptions continue to unfold, PwC maintains its competitive edge by delivering value to its clients. Quality and the development of prominent, trust-based relationships remain the primary elements in value creation for stakeholders, partners, clients, and society. In line with PwC's updated strategy "The New Equation", the organisation takes a holistic approach to critical problem-solving and decision-making with long-run implications (PwC n.d.).

PwC Cyprus is formed of a diverse international workforce with an extensive range of talented employees. Their branch in Cyprus employs nearly 1200 people, with each and everyone of them serving as a distinctive problem-solver who integrates expertise, innovation and technological advancements to establish lifetime customer relationships and increase loyalty. The primary operations of the organisation focus on an extensive selection of financial accounting services such as Assurance, Advisory, Tax, and Legal. PwC Cyprus serves industries like

Banking, Funds, Real Estate, Energy, Insurance, Logistics, Retail, Government, etc. Overall, the company emphasises on creating tailored solutions for its clients, that are thereby able to respond to their challenges, foster new opportunities, tackle potential threats, and ultimately create value (PwC n.d.).

During the year ended December 2023, PwC Global ranked 2nd based on revenue streams of the Big Four accounting/audit firms worldwide. First comes Deloitte, with total revenue of \$65b, next follows PwC with \$53.1b, EY and KPMG with \$49.4b and \$36.4b respectively (Statista 2023).

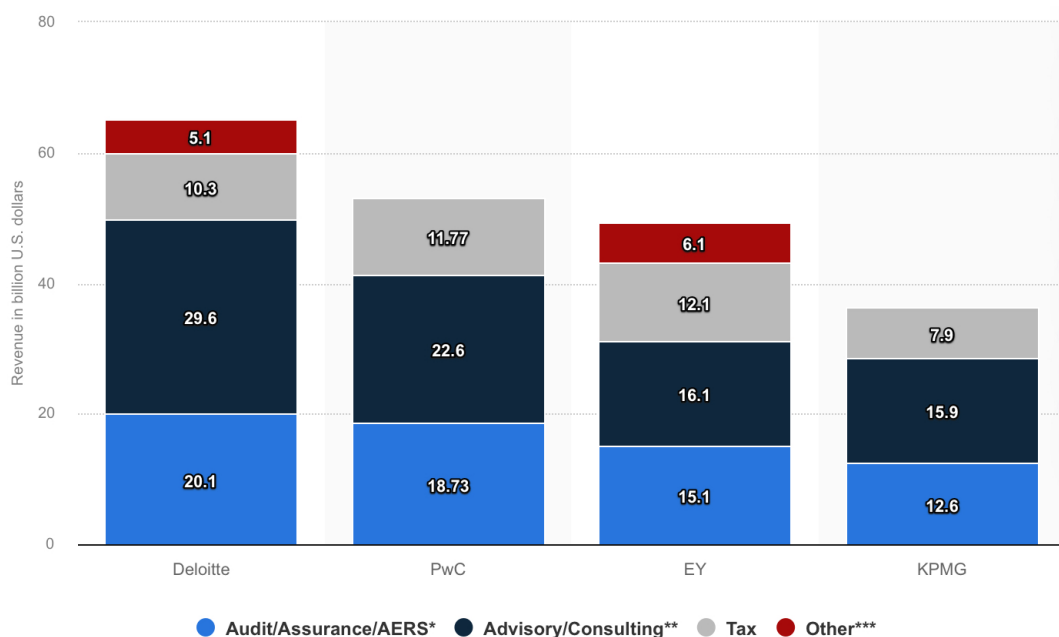


FIGURE 1. Revenue of the BigFour in the financial year ended 2023

(Statista 2023)

2.2 Purpose and significance of the research

The primary objective of this thesis is to develop a guide tailored for the audit department of PwC Cyprus, emphasising on the integration of Artificial Intelligence into existing audit and dealmaking procedures. By further evaluating the potential applications of AI within the industry, the author aims to provide audit experts with practical strategies and comprehensive insights aimed at upscaling operational efficiency as well as optimising audit and dealmaking procedures within the framework of the organisation.

PwC Cyprus would gain considerable benefits from a guide detailing the integration of AI into audit and dealmaking procedures. To commence with, such a guide would provide the organisation with substantial insights and strategies to further enhance the efficiency and precision of auditing practices. The adoption of AI-driven technologies carries the potential of streamlining repetitive tasks, analysing extensive data sets with greater accuracy, and also unveiling valuable information or employee pain points that could have remained hidden for a while longer. In dealmaking, AI-driven technologies could facilitate more precise decision-making by quickly evaluating risk exposure, identifying opportunities and threats, and optimising negotiations. The research's findings are primarily based on interviews with current employees at PwC Cyprus, which allows for recommendations tailored to their needs, concerns, and expectations. Prompting AI through the "roadmap" developed by the author would not only position PwC Cyprus at the forefront of industry trends but would also allow the continued delivery of high-quality services, embracing trust and loyalty within the market and the overall competitive landscape of Big Fours.

2.3 Scope and limitations

The primary source for gaining valuable insights will be an interview with current employees at PwC Cyprus. This brings the authors to an extent of limitations. To commence, the sample size was restricted. The desired number of interviewees was 12-15, however only 8 participated which therefore limited the findings. Moreover, due to ethical considerations and the organisation's confidentiality regulations, the responses may not be as thorough as expected and lead to resource constraints. To avoid this, the author analysed previous studies, BigFour publications, as well as IT and Business Articles in addition to the primary data collection resource, the interviews.

3 RESEARCH METHODOLOGY

3.1 Research question

Given the fact the landscape of audit and dealmaking is extremely complex, the adoption of AI-driven technology would sound ideal. However, it must be noted that the implications of AI are proven to be unpredictable, and therefore unnecessary complexities and workforce disruptions may arise due to the inadequate usage of High-tech and AI. PwC Cyprus has already automated various procedures and repetitive tasks, however, based on the author's experience during a work placement at their offices, the author observed excessive workload and high levels of pressure applied to the audit team.

Thus, after identifying the problem of excessive workload and burnout, the author has defined "How could AI be incorporated into audit and dealmaking procedures to increase operational efficiency and ease complex processes?" to be the main research question and area of focus. More specified sub-questions like, "Which specific areas of the audit processes would most benefit from the power of AI and how? What could be the negative impact of AI usage in dealmaking, and What sectors are the most fragile and require delicate customer service thus AI should be avoided?" have been answered by the interviewees and supported by literature, personal experience, and documental analysis.

3.2 Research methods

For this practice-based thesis, the author has chosen four (4) research methods for the development of the study. As briefly discussed below, these are literature review, participant observation, interviews, and documental analysis. A broad range of research methods has helped the student in creating a comprehensive analysis and evaluation of the topic. Also, having multiple research methods is a proactive measure for resource constraints.

3.2.1 Literature review

One of the central research methods utilised in this dissertation is literature review. This method entails a thorough examination and analysis of scholarly works, business articles, and academic journals written by industry experts. By combining existing knowledge and empirical findings, the literature review provides a comprehensive perspective of the theoretical underpinnings, trends, and challenges associated with AI adoption in a professional context. Utilising resources like Google Scholar, academic databases as well as Big4 annual publications and newsletters allows for the identification of relevant studies and publications spanning various disciplines. Previous research studies offer insights into AI's impact on audit procedures, dealmaking strategies, and client relationships, providing a foundation for contextualising observations made at PwC Cyprus. Moreover, business articles and journals written by scholars contribute practical perspectives, enriching the theoretical framework with real-world examples and case studies.

3.2.2 Participant observation

Participant observation stands as a pivotal research method for the investigation of AI integration within audit and dealmaking procedures. Drawing from the author's immersive five-month work placement at the organisation, this approach entails direct involvement in day-to-day activities and interactions. An extensive range of information regarding the company's operations, habits, challenges, and views has been gathered in digital, physical, but also mental forms. The author does not have access to the company's files anymore, but the experience gained during those 5 months, has been a core element of the research. In essence, participant observation enables a detailed examination of the lived experiences surrounding AI integration within PwC Cyprus. It facilitates a precise and contextualised understanding of challenges, opportunities, and adaptations directly linked with the intended result of this dissertation.

3.2.3 Interview

In addition to the personal experiences gained, interviews have been conducted with the author's manager and former colleagues. The specific number of interviewees was less than desired as some of the participants were not available to participate. The interviews were semi-structured in order to allow for more precise results. Specifically, some questions were pre-determined whereas others were based on the ongoing conversation. Also, the author focused on open-ended questions to gather intel that would have otherwise remained hidden. By allowing interviewees to freely express their opinion rather than choosing their answer from a list of options led to better and more precise results, which is the overall purpose and desired outcome.

3.2.4 Document Analysis

In the pursuit of comprehensively exploring the integration of AI within the audit and dealmaking practices of PwC Cyprus, the author has chosen document analysis as one of the research methods. This approach involves examination of a diverse range of documents, including internal reports, client communications, policy manuals, and any other relevant materials utilised by the Company. Given the author's five-month work placement at PwC Cyprus, this method leverages firsthand exposure to internal documents and procedures. However, it must be noted that the author does not have access to real-time documents anymore, as she is not currently employed. All the documentation used is one or two years old.

Moreover, document analysis serves as a bridge between theory and practice, as it allows the author to cross-reference theoretical frameworks and industry practices with the real-world applications observed at PwC Cyprus. Through a thorough examination of such documents, the author aims to identify patterns, trends, and potential discrepancies that contribute to a nuanced understanding of the AI's integration impact on client relationships and operational efficiency. Overall, the document analysis stands for a robust tool, capitalising the author's

direct involvement with the commissioner and offering a comprehensive exploration of the practical implications of AI integration within a professional setting.

3.3 Data analysis methods

To answer the research question “How could AI be incorporated into audit and dealmaking procedures to increase operational efficiency and ease complex processes?” qualitative data was gathered.

In their article “What is Qualitative in Qualitative Research”, Aspers and Corte (2019) delve into the fundamentals of qualitative research within the domain of sociology. Specifically, they advocate that qualitative research serves as an approach to comprehend phenomena through human experience and interpretations. In contrast to quantitative research which mainly relies on numerical data and statistics, qualitative research focuses on exploring realities, subjective perspectives, and a contextual understanding of phenomena through thematic, content, and theory analysis. Overall, the authors emphasise the importance of grasping the lived experiences within specific contexts thereby providing insights into the underlying complexities of the industry in question (Aspers & Corte 2019.).

In analysing the qualitative data gathered from the interviews, a methodology of encompassing diverse strategies was employed. Utilising charts, questions were translated into percentages to yield quantitative insights where feasible. However, certain inquiries demanded a more intricate examination, necessitating a comparison of responses with established theories and personal experiences. This dual approach facilitated the extraction of nuanced insights, fostering connections between participant perspectives and theoretical frameworks. By synthesising empirical evidence with theoretical underpinnings, comprehensive conclusions were drawn enriching the analysis with both empirical and interpretive lenses.

4 THEORETICAL FRAMEWORK

4.1 Audit

Any business owner is not only responsible for keeping the books of financial transactions but also conducting systematic audits. This process is necessary for ensuring that the company adheres to the standard and legal operational principles for effective accounting processes.

Audit refers to the systematic examination and verification of a company's financial statements, transactions, and internal controls. PwC's audit services aim to assure stakeholders, including investors, regulators, and the public, regarding the accuracy, reliability, and integrity of financial information reported by the audited entity. A typical audit process involves evaluating financial statements, such as balance sheets, income statements, and cash flow statements, to ensure compliance with accounting policies and standards as well as regulatory requirements. Auditors also evaluate the effectiveness of internal controls conducted by the team to mitigate risks and preserve assets.

Based on the above, it can be concluded that there are two distinctive categories of audit testing: substantive tests and internal controls. While internal control testing refers to reviews based on standard principles, risk management assessments, and materiality levels, substantive testing is more direct and validates the balance of financial statements through vouching and recalculation. For instance, inventory testing necessitates that the auditor implements stock count physically at the client's premises based on sampling. Whereas, in terms of internal control is done remotely; inventory testing primarily relies on reviewing transactions, invoicing, shipping, and acquisition documentation for the proper sign-off. The goal of both strategies is to present accurate and equitable values in the financial statements, together with complete and up-to-date information, and alignment with the General Accepted Accounting Principles (GAAP). The scope of the audit and testing performed are agreed upon the completion of the planning stage. Overall, the lower the materiality, the higher the risk indicator, which thereby impacts the selection of tests that will be performed.

In the Harvard Business Review article “The Process Audit” by Hammer (2007), the concept of audit is explored within the context of business processes. An Audit is defined as a systematic analysis and evaluation of an organisation’s processes and practices to ensure alignment with desired objectives, standards, and regulations. Unlike traditional financial audits that focus mainly on financial statements, a systematic audit delves deeper into the operational aspects of an organisation, aiming to identify inefficiencies, weaknesses, and opportunities for improvement in various business processes. The audit process entails analysing data, interviewing stakeholders, and observing workflows to assess performance, compliance, and effectiveness. In essence, Hammer advocates that the overall goal of audit is to drive continuous improvement, enhance organisational efficiency, and optimise performance.

Throughout the audit engagement, auditors may perform various procedures, including testing, balance confirmation with third parties, evaluating the adequacy of accounting policies, and implementing inquiries with management and personnel. The overall goal of the audit is to provide an exclusive and independent opinion on whether the financial statements of the year present a true and fair view of the company’s financial position and performance.

4.2 Artificial intelligence

The origins of artificial intelligence date back to 1950 when Alan Turing decided to examine whether computers can think (Muggleton 2014). His visions were indeed fulfilled due to computing expansion, including distinguishing patterns of user behaviour.

Throughout history, one can perceive that AI has been given various definitions depending on the context applied. On a more general note, Haenlein and Kaplan (2019) define Artificial Intelligence as *“a system’s liability to interpret external data correctly, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation.”*

In today's complex world though, there are various definitions for AI depending on the field of conceptualisation (Kaplan 2016). In 1955, John McCarthy, founder of the discipline, defined the process of AI as “*that of making a machine behave in ways that would be called intelligent if a human were so behaving*” (McCarthy 2006). However, this notion of his has become an issue for discussion as it may not be so accurate after all (Manning 2020).

Artificial Intelligence (AI) encompasses the advancement of computer systems and algorithms developed to simulate human intelligence and problem-solving capabilities, like reasoning, perception, and learning. Through AI drive technologies, computers and machines are designed to process extensive amounts of data, extract meaningful insights, make decisions, and adapt to evolving circumstances autonomously. These systems make use of various techniques, including machine learning, language processing, and robotics to mitigate complex tasks and challenges across diverse industries, ranging from healthcare and education to finance and transportation (IBM 2023). AI continues to accelerate rapidly, driving innovation and reforming industries with its transformative abilities. However, while the hype revolving around AI tools is growing, AI ethics and responsible AI have become a hot topic for debates.

A couple of years later, in 1956 the project of the Dartmouth Conference on Artificial Intelligence studied the notion that “*every aspect of learning or any other features of intelligence can be in principle so precisely described that a machine can be made to simulate it*”. Specifically, this study focused on aspects like automation, computers using a language and their ability to self-improve (Zemankova 2019; Cordeschi 2007).

One of the core issues that challenged the researchers at the Dartmouth Conference was the fact that computers can be used for various aims, and thus what could be the “*neurophysiologists’ contribution*” to developing machines with human logic functions. Oettinger, in his presentation “Contrasts and Similarities”, outlined two distinct approaches to simulating human brain functions using computers, noting that they were related but not identical (McCulloch, Oettinger, Rochester & Schmitt 1956).

The first approach, which was engineering-based, aimed to create efficient machines to support human intellectual tasks. In contrast, the second approach was more theoretical, and sought to comprehend the human brain and behaviour. This differentiation, articulated by Oettinger, laid the groundwork for a fundamental distinction in the field of artificial intelligence. The simulation goal of the engineering-based approach was to develop computers that could effectively mimic or enhance human cognitive abilities (McCulloch et al 1956; Cordeschi 2007). More specifically, Oettinger advocated that while machine designers may leverage the computer's strengths, for instance, speed and accuracy, they could also try to integrate these human brain capabilities such as adaptability to new circumstances. He highlights though, that “... *in any case, simulation only deals with brain functions, not with brain structure.*”

In this instance, Oettinger emphasized a point he had previously made in a 1952 article, but now more explicitly: he noted that many simulations of living functions, did not rely on mimicking nature, but instead they often employed structures and methods not found in living organisms, resulting in enhanced performance. Regarding digital computers, Oettinger highlighted their structural differences from the human brain and suggested that in the future, machines may only have a functional resemblance to living organisms, rather than replicating their structure entirely.

In his theoretical approach, Oettinger wanted to prove that “*Computers are tools for testing hypotheses regarding brain functions... they can be used as neurological and psychological models...*”. Oettinger introduced two cases within the theoretical approach: mathematical and verbal. In the mathematical form, computers are used to solve numerical equations, functions, etc. In the verbal form and according to Hebb's theory of learning and concept formation, computers mimic the neuron network; Hebb's notion of “cell assemblies (Bush and Mostteller 1955; Hebb 1945; McCulloch et al 1956; Cordeschi 20007).

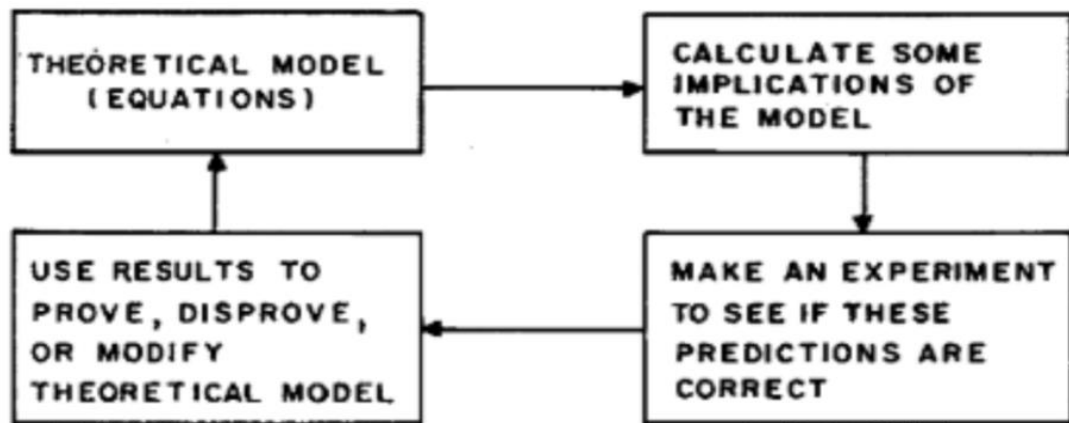


Figure 2. A methodological cycle that examines Hebb's cell assembly theory
(Cordeschi 2007)

Figure 2 illustrates Rochester's methodological cycle that examines Hebb's theory, as presented at the symposium. The process begins with developing a model as a computer simulation of how the brain functions. Next, implications are identified and tested, and data is used to support, reject, or alter the initial model or theory. Over the years, Rochester's notion was accepted by AI pioneers and was characterised as a realistic approach for simulating the human brain and behaviour (Bush and Mostteller 1955; Hebb 1945; McCulloch et al 1956; Cordeschi 20007).

At the 1955 symposium, Otto Schmitt's talk, "The Brain as a Different Computer", sparked lively debate, focusing on contrasting the abilities of biological brains and digital computers (McCulloch et al 1956). Schmitt, a biologist, emphasised the need for computers to emulate human-like flexibility in reasoning to effectively simulate brain functions. He proposed the adoption of "grey-logic" allowing computers to handle ambiguous and abstract concepts, unlike the rigid black-and-white-logic prevalent at the time. Discussion following Schmitt's presentation centred on how common-sense knowledge could be integrated into computer programs, especially for complex decision-making tasks. Schmitt highlighted the human brain's strength in making prompt decisions based on inadequate evidence, a capability that rigidly programmed computers struggle to replicate. He emphasised the importance of providing machines with a wealth of factual information, personal beliefs, and the ability to revise conclusions; traits not commonly found in traditional logic-based reasoning systems (McCulloch et al 1956; Manning 2020).

The Dartmouth Conference marked a pivotal moment in the history of AI, raising several key issues that would shape future research directions and debates. To name a few, symbolic programming, realistic organisms, and engineering tasks. The role of neurophysiology in comprehending behaviour and brain processes was one the core highlights of the Conference amongst other discussions on how to incorporate knowledge into computers, the relevance of logic in handling real-life situations, and the integration of decision making and operations research with the emerging AI techniques (heuristic programming). Overall, the symposium saw a shift towards heuristic programming as a dominant approach in AI, with programs like Logic Theorist gaining dominance.

In 2006, the Dartmouth College Artificial Intelligence Conference: The Next 50 Years (AI@50) had set three objectives: celebrate and reflect on the Dartmouth Research Project, analyse the evolution of AI, and forecast the future of AI within the next 50 years (AI@50). The key highlight of the conference was the disagreement between the team on whether AI should be logic-based or probability-based. This dilemma remains unsolved and a topic of discussion until today. When asked about the predictions to 2056, the researchers of the initial conference had diverse beliefs (Moor 2006).

Some argued that AI is not likely to reach human level by 2056, whereas others strongly advocated that smart machines are not that far off. Claims made by the opposing researchers viewed that AI would be under the domination of politics rather than humans. Today, high-tech solutions are considered to be disruptive as they put an extensive amount of power, power that could be wrongly used, in the hands of governments and individuals (Moor 2006; Cordeschi 2007).

In essence, both the 1956 and 2006 Dartmouth Conferences, prove that computers can implement intelligent tasks. However, the dangers of AI continue to unfold. Providing accurate technological projections is unrealistic and hazardous. The future is uncertain, thus the most optimistic solution according to the team of experts is to continue putting down all possible scenarios, analyse them, and establish a proactive approach for the future development of AI (Moor 2006).

4.2.1 AI software

AI is among the most discussed topics of the past decade as it grew exponentially and gained popularity in all industries. From big corporations to individuals, AI can provide convenience and tailored solutions. However, it is equally important to keep up with technological upgrades and know how to benefit from them.

AI software is designed to offer extensive services; coding, presentation, website creation, etc. In general words, AI software is the backbone of AI as a whole. Companies are continuously trying to incorporate AI and exploit its development. A primary example of a widely used AI software is Grammarly. Grammarly is an AI-driven spell- and grammar-checker that helps individuals upscale their writing skills, styles, and cohesion. The main features are free, but unlocking more advanced ones, like checking for plagiarism and change of tone, requires a yearly subscription (Williams 2024). Similarly, Quillbot.Ai is a software designed for paraphrasing text. It is time efficient, as the user can generate paraphrased text in a matter of seconds. Sometimes such platforms are beneficial for students in terms of practicing their skills or getting ideas; not for copying the text. Again, the platform provides some free services, and charges users a yearly fee if they desire enhanced features.

Another known platform is OpenAI; a research engine dedicated to enhancing AI safely and ethically. A popular project of OpenAI's is ChatGPT. The platform is a hightech chatbot, designed to answer questions regarding any subject. The platform operates by asking the user to type a question or concern, and ChatGPT provides answers based on historical data. GPT has been trained on massive datasets entailing a broad range of topics, allowing it to produce text responses that indicate a comprehensive understanding of language and context. The major issue with this, is that the data is not backed up, which raises reliability and accuracy concerns. However, in the following chapters some benefits and drawbacks linked to OpenAI have been further elaborated (OpenAI n.d.).

Among others, Power BI by Microsoft has also gained popularity recently. The platform is used for data visualisation and interpretation. The core focus of the

platform is business intelligence. The key feature of Power BI is that it operates as an ecosystem; everyone in the organisation has access to the same data analytics and insights. It is commonly embed into an app or webset to which all employees have access. Other features of the platform are data connectivity, data modelling, data visualisation, as well as the creation of reports and dashboards. As with any kind of software, Power BI does offer a free version as well, but the main elements are unlocked through an annual subscription (Stich n.d.).

For instance, Power BI offers connectivity to a wide range of data sources, including databases, files, online services and custom sources. Often users extract data from sources like Excel, SharePoint, Salesforce, Google Analytics, etc (Microsoft n.d.; Stich n.d.). Users can also create models within Power BI by defining relationships between tables, creating calculated columns and measures using data analysis expression languages, and applying filters to organise data effectively (see Figures 3a and 3b). Moreover, Power BI offers a wide range of visualisation options, including charts, maps, tables, and custom visuals within its marketplace. Users can customise the appearance and formats to effectively communicate insights. Of course, the tool also allows users to create interactive reports and dashboards by combining multiple visualisation options (Stich n.d.).

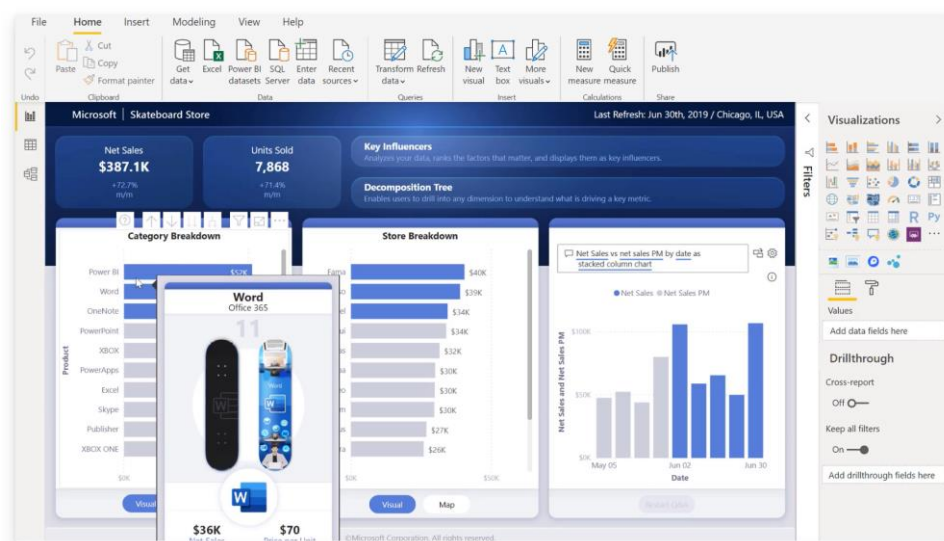


FIGURE 3a. Data Visualisation

(Microsoft n.d.)

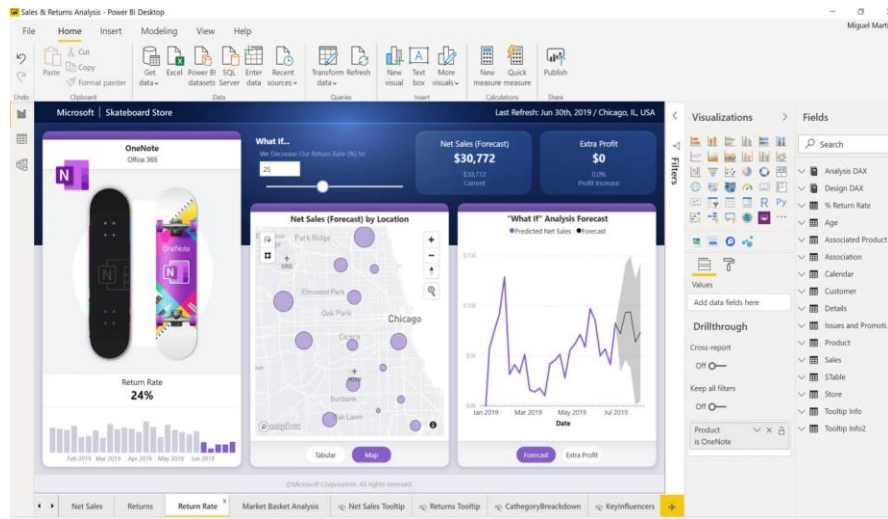


FIGURE 3b. Power BI charts and dashboards

(Microsoft n.d.)

For the more advanced users, Power BI can provide enhanced data analytics services, including built-in AI features, such as Quick Insights, which automatically generates insights and patterns from data. Furthermore, the platform has its cloud/ecosystem which means that insights and data can be easily and securely shared with colleagues and stakeholders (Microsoft n.d.).

Overall, Power BI is a powerful tool for data analytics and visualisation. It adheres to security and compliance standards, ensuring that data is encrypted both in transit and at rest. Its intuitive interface, extensive connectivity options, and advanced analytics features make it a desired choice for organisations looking to derive insights from data.

4.3 Machine learning (ML)

Another significant advancement in the field of AI is associated with deep learning, a machine learning technique that is nowadays widely employed in the majority of algorithms that rely on artificial neural networks. Through these and other techniques, AI has been able to be integrated into the daily activities of individuals and businesses as part of decision-making processes.

Machine Learning (ML) represents a form of AI that allows computer systems to draw conclusion from data or observations, to enhance forecasting through

continuous learning (Abedin, Hassan, Hajek & Uddin 2021). While primarily linked with computer science, ML finds application across various domains including finance, accounting, research, marketing, and applied sciences. ML has also gained significant recognition among practitioners, academics, and professionals due to its inherent predictable capabilities (Abedin et al 2021). In this constantly evolving world, ML has the power and potential to revolutionise prediction methodologies for practitioners and streamline data collection and analysis for researchers.

According to Mohammad Zoynul Abedin et al. (2021) any interdisciplinary field called computational finance combines empirical finance with computing techniques and helps in the development of financial data modelling systems by integrating computer algorithms. Key financial domains such as risk management, bankruptcy prediction, stock price prediction, and asset portfolio management can all benefit from the effective application of ML. In their book, they also advocate that ML can “*provide insights into business performance, risks and opportunities*” in light of the abundance of unstructured data available, including social media posts, reviews, news headlines (Cockcroft & Russell 2018). They continue by adding that ML tools could be of use in auditing, taxation, and managerial accounting for fraud detection and prevention services.

Demonstrated below in Figure 4a and 4b one can perceive that ML is just one branch of AI. The first phase is model training: transforming historical data into predictive models through ML algorithms and the second phase is model testing: the new datasets generate conclusions through the previously created predictive model. More specifically, ML can be divided into three different algorithms as seen below, Unsupervised, Supervised, and Reinforcement Learning. Each one of these is further divided into sub categories depending on the type of data given as input (Lorberfeld 2019; Patel 2018).

Supervised learning is commonly used in instances where samples are based on input-output pairs. It is a task-driven method that either separates data through “classification” or fits the data with “regression”. Unsupervised learning on the other hand, examines unlabeled datasets – data driven method. It is widely used when researchers want to identify patterns, trends, or specific features for certain

purpose s. For example, clustering is utilised in targeted marketing and customer segmentation, whereas dimensionality reduction studies trends and provides conclusions. Finally, reinforcement learning is an algorithm designed to automate the evaluation of behaviour in given contexts and environments. This algorithm known as penalty or reward utilises the insights gathered from the environmental analysis to either enhance the reward or eliminate the risk. It is an extremely useful tool for improving AI models that aim to offer increased operational efficiency through automation (Sarker 2021; Cordeschi 2007; Lorberfeld 2019).

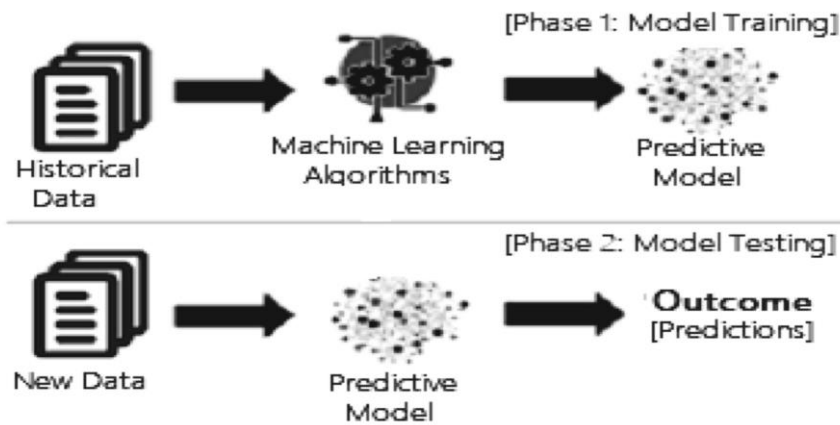


FIGURE 4a. Machine Learning Structure

(Sarker 2021)

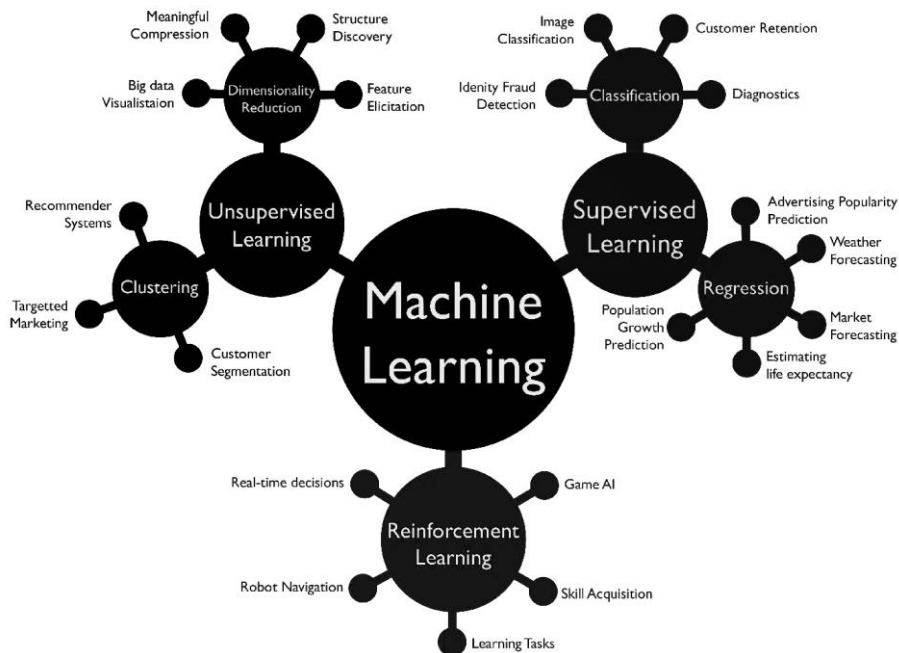


FIGURE 4b. Machine Learning Analysed

(Lorberfeld 2019)

In a more specific context, ML tools can be implemented in accounting and finance evaluations. For instance, content analysis benefits from ML algorithms by providing to the user “*reliability, stability, reproductivity and accuracy*” for data analysis (Bogeaard & Aerts 2011).

4.4 How is AI interpreted and incorporated in audit contexts

AI is automating operations that need human intelligence by supporting human judgement on a wide range of topics, including customer retention, market penetration plans, and project management. (Abdolmohammadi 1987.) Globally scientists and business experts are working to develop autonomous AI that can make even the most complicated decisions without the need of human interaction.

Because many operations in accounting and auditing are repetitious and reliable data is essential for financial evaluations, AI is a natural fit in this industry. It increases the accuracy of accounting information and helps eliminate human error in data entry. In auditing, AI helps in decision-making and sample selection, especially in tasks that rely on rules, and thus allows for improved operational efficiency and mitigates the occurrence of errors.

AI has been used in accounting since 1980s, when it was first used in decision support and expert systems. These systems enhanced the efficacy of audit by concentrating on aspects like internal control evaluation, risk analysis, and audit work program development (Abdolmohammadi 1987). All three areas demanded qualitative analysis and expertise and are repetitive to a certain extent. With AI such procedures can become less complex and time-consuming (Zemankova 2019; Brown & Murphy 1990). Specifically, according to Borthick and West (1987) expert systems could be used to “*plan audits, collect and evaluate evidence and form opinions.*” At an initial stage, AI could suggest materiality levels, assess the level of internal control quality, and evaluate the accuracy of provision amounts.

According to Gal and Steinbart (1987), internal control evaluation would benefit the most from the integration of AI into audit procedures. It is among the most

complex tasks, thus developing an advanced and automated accounting system would ease down the process significantly. Another study of Changchit and Holsapple (2004) indicates the significance of transferring the knowledge of auditors to the upper management team. This would be achieved through the expert systems developed with AI, that would then further allow for inclusive comprehension of the internal control process and generate more effective accounting outputs. Expert systems are typically based on statistical models and are questionnaire-based to better help interpret the challenges auditors are facing, evaluate them through a matrix, and finally calculate the risk (Morris 2023).

The motivation behind early AI development in auditing was to meet increasing competition, lower audit fees, and enhance efficiency without compromising effectiveness. While initially aimed at efficiency, expert systems primarily impacted effectiveness, expertise, and education in auditing practices (Baldwin-Morgan 1993; Brown & Murphy 1990).

Baldwin, Brown, and Trinkle (2006) decided to dive deeper, and found five new areas within the audit landscape that could benefit from the usage of AI – analytical review procedures, classification, materiality assessments, decisions regarding going concern principle, and bankruptcy prediction. Overall, the usage of AI in audit aims at mitigating risk in the three core sectors; *inherent, control, and detection risk*. In regard to going concern and bankruptcy detection, these areas require naturally both qualitative and quantitative analysis.

AI has already been adopted by various organisations to increase the operational efficiency of their daily tasks and responsibilities. Depending on the field of operation, some may seek for increased precision and others may seek for time and cost-efficient methodologies, features that AI can provide seamlessly. But how is AI used in auditing? To commence with, AI has the ability to process and interpret vast datasets quickly and precisely, recognising patterns or anomalies that could lead to fraud, error, or non-compliance. Thereby, AI is a perfect tool for executing statistical analysis providing greater insight to the auditors.

For instance, PwC Cyprus makes use of an automated platform named CaseWare. CaseWare is the platform in which the final stage of the audit, reporting, takes place. The platform is designed to extract data from the main audit and excel spreadsheets which are then cross-referenced with the numbers and figures listed on the final financial statements and accounting policies. CaseWare detects immediately errors, wrong amounts and calculations making it easier for the auditor to correct the error. The same platform is also used for dissenting textual data through natural language processing (NLP). The AI supported features of CaseWare enables it to interpret insights and textual data (emails, financial statements, and contracts), helping auditors identify concerns and inconsistencies throughout the documentation stage.

Furthermore, AI is used within the accounting field to provide predictive analytics. Since most of the AI tools are based on pattern recognition, they can predict the future with increased precision allowing in this way auditors to identify issues prior to causing operational disruptions. For the same reason, AI can assist in identifying fraudulent activities and thereby improving risk assessments – ML models are relied on historical data and transactions which facilitates easier detection of fraudulent activities. Worth to mention is that AI is capable of automating routine tasks – a valuable feature for auditors as it can save them a lot of time and instead focus on other aspects that require delicate handling and precision (Morris 2023). Ultimately, the primary reason for AI incorporation into audit procedures is for increased efficiency of accounting workflows and strengthen the overall quality of the audit and final opinion.

4.5 Opportunities of AI in audit

4.5.1 Robotic process automation (RPA)

Robotic Process Automation (RPA) has gradually made its way into accounting and audit systems of organisations as a first step towards AI integration. RPA refers to automating predefined procedures by running other AI driven software. Characteristically, the IEEE Corporate Advisory Group (2017) has defined RPA

as “preconfigured software instance that uses business rules and predefined activity choreography to complete the autonomous execution of a combination of processes, activities, transactions, and tasks in one or more unrelated software systems to deliver a result or service with human exception management”.

Unlike AI, which is data-driven and needs high quality data to identify patterns and simulate human intelligence, RPA is task-driven, and only executes them based on rules. These two distinctive technologies, however, do not replace one another, instead they integrate each other (EY 2018; Zemankova 2019; Hoffmann 2019).

From a more structured perspective, Figure 5 demonstrates RPA's four core features; Choreographies, IS ecosystems, Modules, and Applications. As already mentioned above, RPA is used for automating processes within a range of various existing technologies that serve different objectives. RPA is also known as a transformative feature of human labour and thorough business task automation. Now, robotic desktop automation (RDA), for instance Microsoft Excel, is a different approach from RPA which automates procedures in a fairly unattended manner. RDA focuses on assisting individuals with activities lie front-offive functions. Nevertheless, RPA and RDA do not entirely adhere to opposing notions or purposes (Hoffmann 2019).

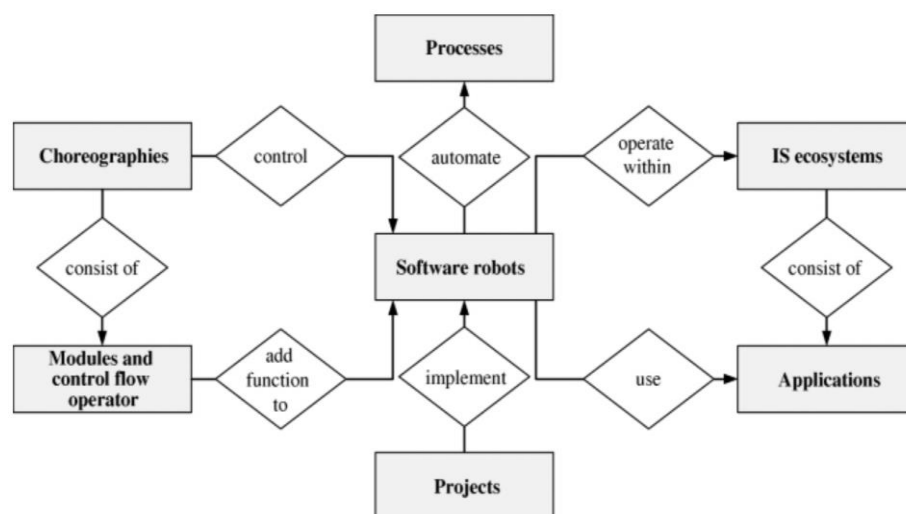


FIGURE 5. Nature of RPA

(Hoffmann 2019)

In addition to being easier to implement and more affordable than traditional process automation, RPA focuses on enhancing operational efficiency, auditability, security, and compliance. Software robots will independently execute the choreography “*uninterruptedly, quickly, flawlessly, and traceably*”; *they* do not actively contribute to process improvement, nonetheless, RPA may assist to enhance primary KPIs. (Willcock, Lacity & Craig 2015; Hoffmann 2019.) In the event that software robots implement predetermined tasks that have inconsistencies or errors, they would ultimately result in extra expenses and unnecessary resource consumption. Process optimisation and development are thereby essential measures before automation. Once RPA enhancements are introduced, they must be maintained in addition to the initial process change (Aguire & Rodriguez 2017; Bygstad & Iden; Fung 2017).

The main benefit of RPA, as discussed below, is that it automates repetitive and tedious tasks that demand little logical effort, and thus saves time for employees who can now reallocate their time to more delicate and critical tasks. Software robots, for example, could help employees with preparatory tasks like gathering and preparing data. However, RPA-based process automation does not operate on the assumption that humans and robots should be kept apart; rather it aims to facilitate effective communication between them.

It is feasible to offer a relief to employees from boring and repetitive tasks. But as people would have to handle exceptions requiring some degree of reasoning, situational and critical judgement, human management restricts the autonomy of software robots. Choosing when to launch an RPA project depends on the required-degree of human-robot interaction as well as the advancement of RPA capabilities. The primary benefit to be noted here is that automation is not restricted to one specific department or process – users/owners of a software can determine when and where to incorporate it.

RPA was initially integrated into audit systems to reduce the burden of auditors from repetitive, rule-based tasks, such as data preparation, file organisation, and audit testing in Excel. The initial project focused on audit planning and involved converting client data into a standardised format, performing rule-based analytical processes, and generating planning worksheets using RPA software. The

second project applied RPA to implement revenue testing by gathering audit evidence, importing it into data analytics software, and implementing pre-determined audit tests on revenue data.

Furthermore, another study on RPA in auditing and specifically on revenue testing elaborated on three crucial steps: reconciliation, internal control, and testing. RPA can perform reconciliation by logging into FTP servers, extracting and comparing revenue listings with trial balances, and generating alerts for material differences. Also, RPA can automate internal control testing and substantive testing by cross-referencing purchase orders, invoices, and shipping documents – JETs (journal entry testing) – therefore validating the effectiveness of internal controls and verifying conclusions regarding existence and valuation.

On a more general note, RPA provides a seamless transition into an automated interface, enabling business operations and strengthening online markets. Amongst others, there is potential for RPA to be also integrated in data mapping, warehouse management, stock count, and CRM. Thereby, studies revolving around RPA should not be limited to the technological extent, but also discover various other perspectives.

On the other hand, according to Asatiani and Penttinen (2016), there are some drawbacks linked with RPA. While automated processes offer faster and more convenience to the user, navigation structure could be notably more demanding and complex. Therefore, they argue that it is very dependent upon each organisation as to whether it views RPA as a “temporary solution” or as a component of its strategic competence. Academics debate whether tactical solutions ought to be selected in order to successfully and sustainably develop the software robots’ continuous management and implementation process.

The agile implementation of RPA project necessitates taking into account both immediate and long-term effects in addition to strategic organisation designs. The process of decision-making in the context of RPA should adhere to a strategic plan, just like any other significant decision made in a company. According to Lacity and Willcocks (2015), when taking a process-oriented approach, it is vital to merge RPA initiatives with other methods for automation and optimisation.

Neglecting to optimise current processes could result in inefficient utilisation of software robots, leading to unfulfilled organisational benefits. Implementing RPA involves more than merely substituting human roles with robots, necessitating exploration into effective procedures for integrating software robots into daily operational routines.

This entails devising a method that assists in identifying relevant processes, selecting the most suitable automation options, and incorporating human oversight for exceptions. Overall, this method should consider the current state of the processes to determine the necessity for process redesign.

4.5.2 Trends in BigFour companies

The current trends and advancements in AI within the audit landscape are primarily being driven by the leading professional companies known as the Big Four; Deloitte, EY, PwC, and KPMG. Each organisation has introduced innovative AI technologies to enhance audit processes and improve efficiency. EY has seen a significant increase in the adoption of AI among middle-market CEOs, allowing the company to focus on higher-value activities (EY 2019a; EY 2019b). Its industry competitor, KPMG, has adopted a holistic approach to AI, providing a portfolio of solutions and services to its clients. Deloitte on the other hand, has formed various partnerships with AI integrated platforms that aim to help auditors in comparing risk strategies and the planning of the audits (Deloitte 2018). PwC Global, has been recognised for its AI innovations, winning the International Accounting Bulletin's Audit innovation of the Year multiple times. Technologies like GL.ai and Cash.ai streamline audit processes related to document analysis, report preparation, and cash audit. These systems leverage AI to replicate auditors' decision-making and detect unusual transactions in financial records.

In essence, the Big 4's adoption of AI driven technologies so far is transforming the audit landscape, enhancing accuracy, efficiency, and value-added services for clients. Through partnerships, development of adequate tools, and exploration

of emerging technologies, such organisations are at the forefront of driving innovation in the whole industry.

4.5.3 Artificial intelligence technologies in audit

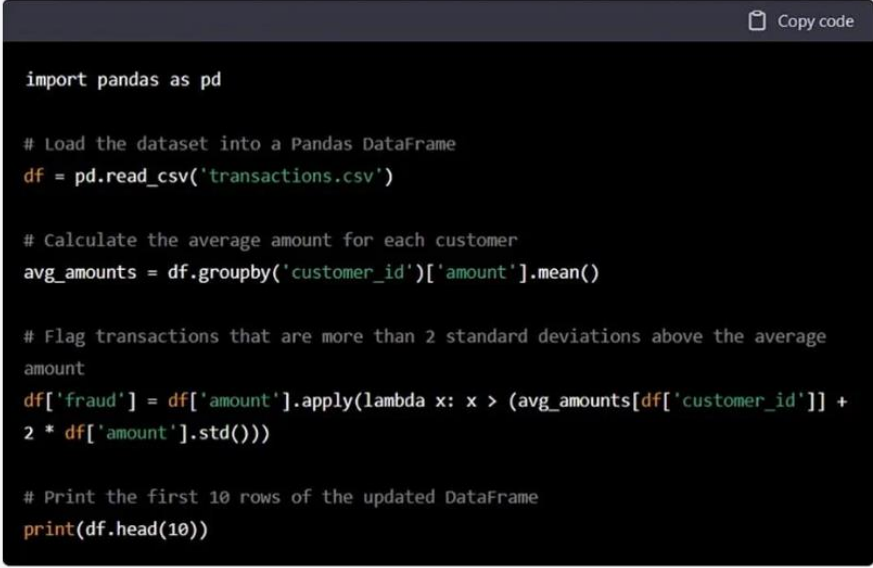
According to previous studies, AI can be adopted into audit and accounting procedures mainly through four types of technologies, those of genetic algorithms, fuzzy systems, neural networks, and hybrid systems. To commence with, genetic algorithms can be used for forecasting bankruptcy and thereby reducing any directly associated risks (Lensberg, Eilifsen & McKee 2006). Overall, algorithms can help ensure that the audit assessment is within the agreed time frame and resource constraints (Ahituv, Halpern & Will 1985). Moving on, a significant benefit of fuzzy systems according to Rosner, Comunale and Sexton (2006), is their ability to use logic and assess materiality among other qualitative factors.

Neural networks serve as another risk assessment tool for auditors. Through their ability to learn, generalise, and allocate data the risk evaluations can be more systematic and consistent. Calderon and Cheh (2002) further add that neural networks are vital for control risk assessments, identifying frauds and errors, financial losses, and providing an opinion on the going concern principle. Finally, hybrid systems, are a combination of all the three mentioned-above technologies, and is used in both quantitative and qualitative evaluations. Three researchers, Davis, Massey, and Lovell (1997), established “the prototype” of a hybrid technology; it combines a neural network and an expert system. The neural network recognises patterns from a vast data set, whereas the expert system ensures adequate usage of control variable relationships.

Moving on to something more recent; Open AI’s ChatGPT is now able to provide impressive initiatives to the audit and accountancy industry. Specifically, J proceeded with this notion and asked ChatGPT to “*Please provide python code for identifying fraud in customers’ transactions data set.*” Eventhough ChatGPT cannot be directly installed into existing auditing softwares, it can assist IT

specialist in coding who have the same goal; make operation more time-efficient and seamless.

ChatGPT then gave this answer: “Sure, here’s some sample Python code that you can use to identify fraud in a customer’s transactions dataset:”



```

import pandas as pd

# Load the dataset into a Pandas DataFrame
df = pd.read_csv('transactions.csv')

# Calculate the average amount for each customer
avg_amounts = df.groupby('customer_id')['amount'].mean()

# Flag transactions that are more than 2 standard deviations above the average amount
df['fraud'] = df['amount'].apply(lambda x: x > (avg_amounts[df['customer_id']] + 2 * df['amount'].std()))

# Print the first 10 rows of the updated DataFrame
print(df.head(10))

```

FIGURE 5. ChatGPT response

(ICAEW 2022)

The Head of Data Analytics and Tech for ICAEW, Ian Pay advocates that this is just one branch of AI’s development. However, he makes it clear that despite that the proposed code is created to identify frauds in transactions, it also poses some ethical challenges. The reason for that is simply because it gives an answer to a delicate aspect that requires critical judgement and sometimes even human interference is needed (ICAEW 2022).

The information and citation sources of ChatGPT are not known to be trustworthy. Thus, many companies avoid to utilise it in critical situations. So far the platform serves as “research preview”, say Ian, as it keeps raising trust issues. Esther Mallowah, Head of Tech Policy for ICAEW, adds that there is risk associated with misinformation. Obviously, due to the lack of source evidence, one may doubt the answer given (ICAEW 2022).

So the main concern when it comes to ChatGPT is transparency. This should be taken into consideration for future improvements or creation of similar platforms. People, especially professionals, want to know where the information/data comes from, when it was published, and by who in order to confidently use the software for professional purposes.

With the same logic as ChatGPT, data analytics can help auditors conduct engagements in an efficient and effective manner. Initially, it can provide accuracy for the analysis of extensive datasets. Data analytics tools are also able to identify patterns, inconsistencies, and areas that may raise risk concerns. Furthermore, the phase of reviewing can become seamless as such tools can give realtime advice which ultimately is a timesaver for auditors who will not have to spend additional time on tracing minor/inmaterial errors.

4.6 Risks and considerations

Among the biggest concerns when it comes to incorporating AI into audit or any other office type of work, which is at the moment based human intelligence, is the fear of job displacement. Throughout the report, the author highlights that the focus is on improving the overall audit engagement through the support of AI rather than replacing human activity with machines.

As already mentioned before, AI hides various risks the impact of which remains unknown. Some of the negative impacts that could set at high risk an audit engagement are data and cybersecurity risks. Simply by automating more tasks and processes, systems and confidential data become more exposed to cyber attacks and thefts. While the notion of having to spend less time on a task sounds as a relief for auditors, not being able to control the exposure of data causes an implication.

In a general sense, implementing any kind of AI techniques and software into existing procedures requires a long-term vision and mindset with concrete plans and development strategies. Thus, tasks that require critical decision-making may need to be exempt of AI tools, unless there is a monitored strategic focus

from humans. While software robots are capable of interacting with the business flows, academics continue to further examine the impact of RPA on infrastructure within corporations. Characteristically, it is argued that “*RPA has not yet developed its full potential.*”

5 CASE STUDY: PwC

5.1 Understanding audit procedures

PwC's audit services are designed to enhance transparency, promote accountability, and foster investor confidence in the market. The audit process at PwC consists of multiple crucial steps designed to ensure accuracy, efficiency, and quality in their evaluations. The diagram as seen in Figure 6, demonstrates the flow of an audit. Firstly, priority is given to scoping and risk assessment, which aim to help the auditors comprehend the business model, key systems and operations, and the overall control environment.

This establishes a solid foundation for interpreting data flows and control environments which are then analysed end-to-end by auditors, supporting financial statement line items, frequently utilising technology to automate the process and generate a digital representation of the company. The next step is to decide which areas need to be tested and what information is required to plan the audit. PwC's global audit platform, Aura, facilitates precision, adherence, and quality, ensuring a smooth flow of information and project management within the desired timeframe.

Following this, data must be extracted through Extract Suite or Connect; online platforms directly linking the clients with the auditors to send and receive seamlessly data and documents needed for the audit. Once the plan has been set and the data has been extracted, auditors can now start executing the audit plan. "Testing and analysis" is the most essential stage during which any material misstatements, frauds, or errors are identified. Halo is a technological tool designed for the purpose of analysing extensive data volumes, while data analytics and visualisation techniques help focus on key audit risks. Upon completion of documentation, auditors report their conclusions, and after ensuring that all tasks have been completed, the Engagement Leader signs the final audit report (PwC n.d.a).

In essence, audit might be a “routine task”, but the process needs to constantly adapt to the evolving technologies and market shifts. PwC claims to continuously advance their audit process by integrating greater digital functionality, such as automation, data analytics, and visualisation. The combination of Machine Learning, Artificial Intelligence, and the expertise of their human workforce specialists drives the evolution of their audit methodologies, capturing a high position in performance charts of their industry standards and best practices.

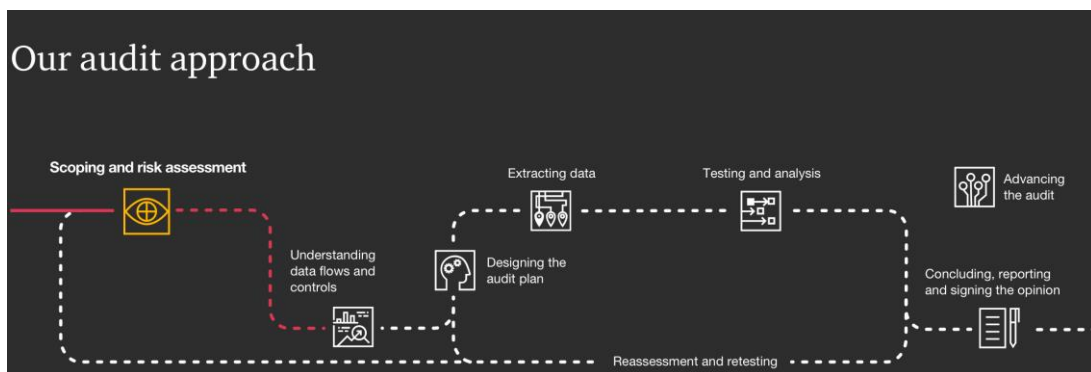


FIGURE 6. The stages of an audit review at PwC Cyprus.

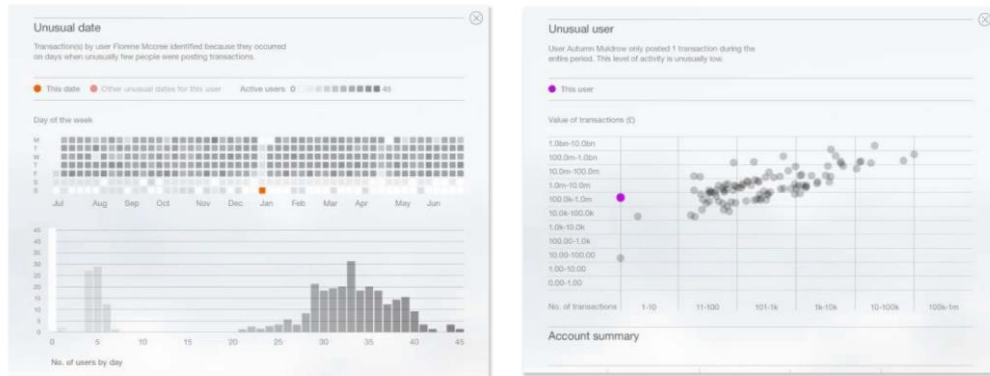
(PwC n.d.a)

5.2 Current technological integration

In their article “Harnessing the power of AI to transform the detection of fraud and error”, PwC Cyprus explains their investment in pioneering AI for the audit. So far, the company has developed a revolutionary bot, referred to as GL.ai, that combines AI and ML to analyse and portray a business by assessing a vast range of data within seconds, reaching information auditors cannot, and detecting deficiencies in the general ledger (thus the name GL.ai). This platform has been awarded as the “Audit Innovation of the Year” back in 2017 and remains until today one of the company’s most significant and successful investments in AI (PwC 2017; PwC 2018).

Simply, the GL.ai utilises the company’s extensive global knowledge and human expertise by incorporating it into algorithms designed to replicate the decision-making process of the auditors. A thorough analysis of every transaction, amount, and account is conducted to identify unusual patterns that may indicate potential

errors or fraud-related activities without bias. Figure 7 demonstrates GL.ai's ability to detect; an unusual activity based on transaction dates, journal entries, and interface users. This entity-specific analysis allows for an in-depth evaluation that can only be achieved through such high-tech and automation-driven solutions.

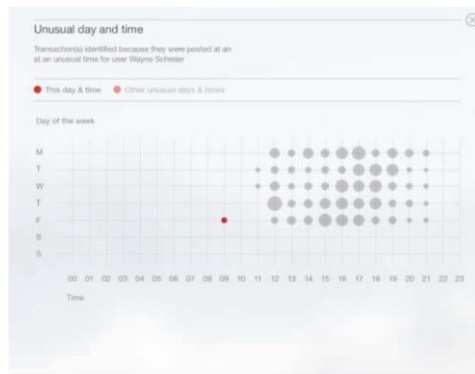


Date

Is the date of an activity unusual for that company?

User

Is somebody who is not a regular user posting journals?



Day and time

Is somebody posting journals at a time or on a day that is unusual for them?

FIGURE 7a. Detection of unusual activity based on date, user, and daytime

(PwC 2018)

The continuous performance improvement of GL.ai has led PwC branches around the world to accelerate the audit process, generate valuable insights and enhance operational efficiency by interpreting a vast amount of data without sampling limitations. PwC is currently developing various other Audit.ai platforms to further revolutionise the audit processes, focusing on delivering expectational and high-quality services, while at the same time allowing auditors to strengthen their strategic thinking and establishing relationships essential for translating data into feasible business strategies (PwC 2017).

Currently PwC Cyprus relies on primarily on five tools and technologies to support their audit process; Aura, Connect, Connect Audit Manager, Halo, and Count. Baaed on the author's experience, Aura is an audit documentation platform that serves as a backbone for building and executing the audit plans, by developing transparent connections between risks, procedures, controls, and work performed. It provides comprehensive guidance and project management capabilities, allowing for target audit plans with specific risk levels and real-time dashboards to track audit progress and scoping decision efficiently (PwC Cyprus 2023a).

Aura visualises the 4 stages that integrate the audit review. In short, the process initiates with planning, during which the main activities to be taken are defined. The second stage involves internal control assessment and analysis of the entity. The third and most important stage, Evidence Gathering Activities (EGAs) involves testing and covers all the necessary analytical procedures. And finally, completion activities usually refer to financial reporting and performance assessment.

Connect (see Figure 8a and 8b) is a collaborative platform for clients to securely share audit related documents and deliverables, streamlining tracking and resolution for outstanding items and issues identified during the audit. Clients are able to gain visibility into audit adjustments and progress at anytime. Similarly, Connect Audit Manager streamlines and standardises coordination for regulatory audits, offering a digital system for transparent workflow management enhancing compliance and quality.

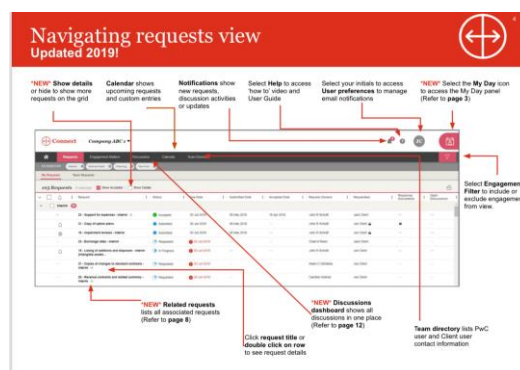
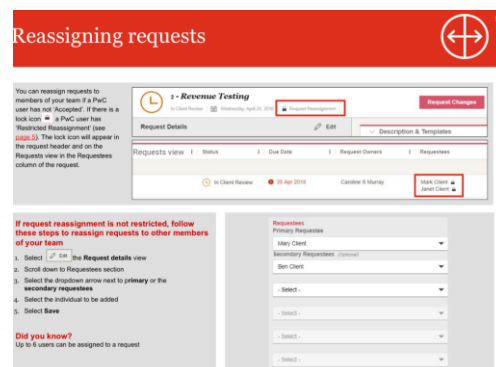


FIGURE 8a. Assignees



8b. Requests

(PwC 2019)

Large datasets are analysed using data auditing technologies in Halo to enhance risk assessment, evaluation, and testing. For instance, Halo for Journals detects appropriate journals according to predefined standards, making data research and representation for testing procedures more convenient.

Count streamlines inventory counting operations from start to end. It enables the engagement team to design and oversee protocols, track results from various devices, and transfer completed records into Aura for seamless integration within the overall audit process.

The partnership between Alteryx Analytic Process Automation (APA) Platform and PwC's expertise in digital transformation aims to expedite solutions for organisations. Alteryx streamlines analytics, machine learning, and data science processes, facilitating quicker digital transformation. This collaboration empowers individuals to enhance digital skills, share innovations across the company, and accelerate business results.

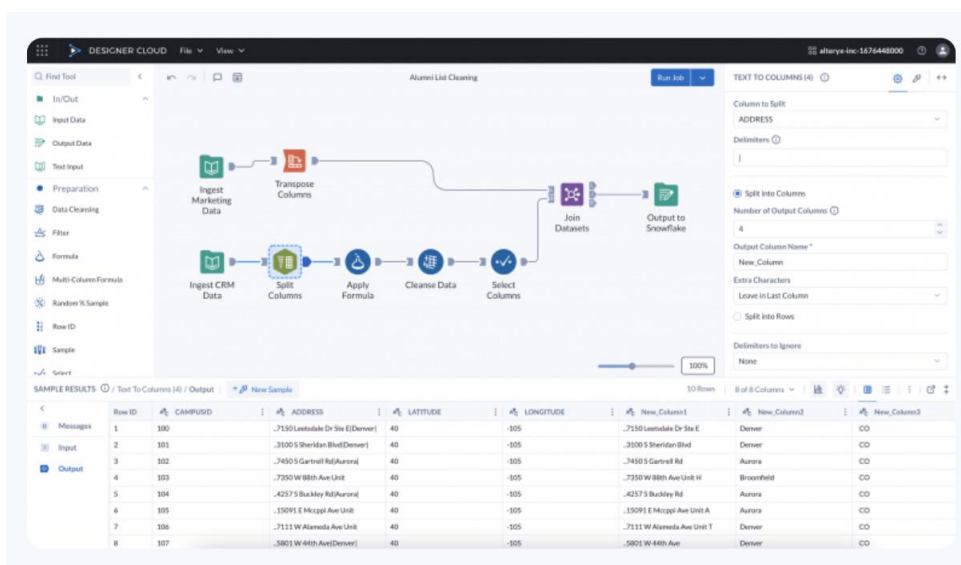


FIGURE 9. Alteryx

(PwC Cyprus 2023b)

In their Annual Review of 2023, PwC Cyprus claims to have changed its market strategy to align with the emerging market shifts and client needs. The global market has witnessed the development of high-tech and AI automated solutions that needed to be incorporated into the company's business model to ensure compatibility with demand. Specifically, the company has said that "we proudly

embrace the automation and AI technologies, revolutionising processes, data entry, and financial analysis. These innovations enhance accuracy, efficiency, and data-driven decision-making...” (PwC Cyprus 2023b)

5.3 Common concerns and implications

The complex landscape of audit hides various concerns and implications, which unfortunately also influence the performance of the employees. Common issues identified are excessive workload that leads to burnout and delays in conducting audits that lead to weaker client relationships. These implications have been experienced by the author during the internship at the offices of PwC Cyprus and are now part of the research.

Through the interviews conducted, the author wanted to tackle down the causes of delays, pain points, and excessive workload. Prior to analysing the responses, possible reasons for delays and workload could be the nature of repetitive and time-consuming audit tasks. Some of the audit stages are highly repetitive and require attention to detail, whereas other require thorough and meticulous consideration. Oftentimes, the consequences of such can be evident in the decreased productivity of employees, burnout, misunderstandings, and unnecessary escalations. In dealmaking this would affect client relationships, threaten potential partnerships, and ultimately negatively affect reputation.

The successful integration of AI hinges on addressing primary concerns such as job displacement, data privacy, and complexity. Specifically, it is crucial to cultivate a harmonious relationship between humans and machines for alleviating fears of jobs loss among auditors. Tasks such as data extraction, analysis, and even some aspects of decision-making could be automated, raising concerns about job displacement. However, it is crucial to recognise that AI is not a replacement for auditors but a tool to augment their capabilities. Auditors will continue to play a dominant role in interpreting complex data, exercising professional judgement, and providing strategic insights to clients. PwC Cyprus, ought to focus

on training auditors to leverage the power of AI technologies effectively, emphasising the development of skills in data analysis, critical thinking, and client engagement.

Data privacy and cybersecurity are paramount considerations in AI integration efforts. The employees at PwC Cyprus suggested the implementation of robust protocols for data encryption (which already exist to a certain extent), access control, and compliance with regulatory frameworks such as GDPR. Moreover, transparent communication with client regarding data handling practices instills trust and confidence in the audit process.

Another primary concern mentioned by the employees is that of the complexity of AI integration. Equipping auditors with the adequate skills through comprehensive training and supportive initiatives is fundamental for driving adoption and maximising benefits. PwC Cyprus ought to assess the readiness of its existing systems and processes for AI integration and develop a comprehensive strategy to address technical and ethical challenges. This entails identifying suitable AI solutions tailored to the specific needs (which was done through the interviews) of the audit engagements and ensuring compatibility with existing IT infrastructure. Collaboration between IT experts and continuous monitoring of performance metrics enable constant improvements and optimisation of AI-driven audit procedures that eventually effectively can navigate the complexities associated with AI integration.

While AI presents significant opportunities to enhance audit efficiency and effectiveness, addressing concerns such as job displacement, data privacy, and integration complexity requires a holistic approach. PwC Cyprus should continue to prioritise the development of its workforce, invest in robust data governance practices, and consciously plan and execute its AI integration strategy to recognise the full potential of AI-driven audit engagements. Being proactive can enable the organisation to place itself as a leader in AI-enabled audit services while maintaining the highest standards of professionalism and integrity. It is important to understand that by identifying the roots of these implications, which the author

aims to achieve through the interviews, and by analysing the benefits of AI incorporation the operational efficiency of the tasks along with the productivity levels of the employees would be significantly improved.

6 INTERVIEW FINDINGS

6.1 Overview of interviewed employees

In total the author interviewed 10 employees of PwC Cyprus within the audit department. Each one of the interviewees had to respond to 18 questions: open-ended questions, fixed questions, and semi-fixed questions. The interviews were conducted over a Microsoft Teams video call.

6.2 Identified needs and concerns

To commence with, the first question had a general tone and required the interviewees to give a brief explanation/ task description of the main parts of an audit engagement. In short, the typical workflow involved in conducting audits at PwC Cyprus is as follows: planning the work, executing the work, and completion of the work by assessing any material/risk factors.

The interview findings have supported the previously discussed common concerns and implications that may emerge during an audit review. It has become evident that there are three distinctive categories adding up to the burden of auditors' workload: repetitive tasks, audit engagement delays, and client management. More specifically, when asked "How much time do you spend on repetitive tasks?", all 10 interviewees responded with 25%-50%.

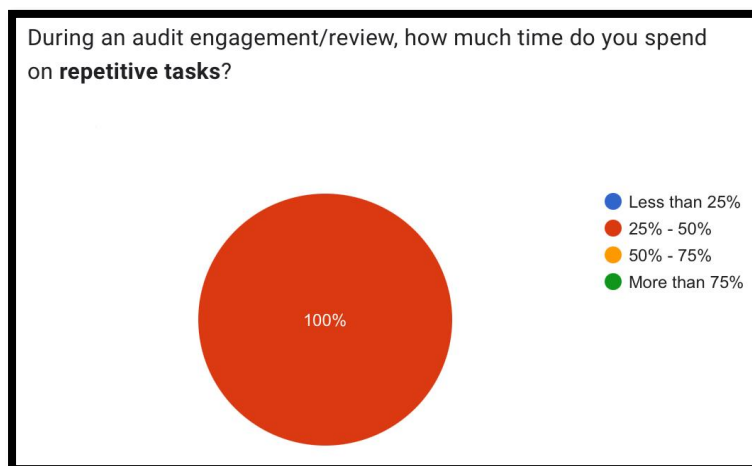


FIGURE 10. Repetitive Tasks

The author then further proceeded by asking the employees to name some of these repetitive tasks and key pain points. The main responses revolved around; preparing lead sheets for testing, preparing bank letters, preparing pending lists and deciding on the sample to be requested from the client.

Another significant yet expected finding based on the author's experience is that the main reason for delays is client cooperation. Two of the interviewees characteristically mentioned that client cooperation is among their "biggest headaches". What is meant by this, is that clients sometimes do not send the required documents/evidence needed for the audit in time which ultimately affects the deadline, *"we have to call clients multiple times a week, sometimes even a day, just to receive one piece of information... it is very frustrating and it happens on a regular basis... we might even get yelled at but it is part of the job..."*

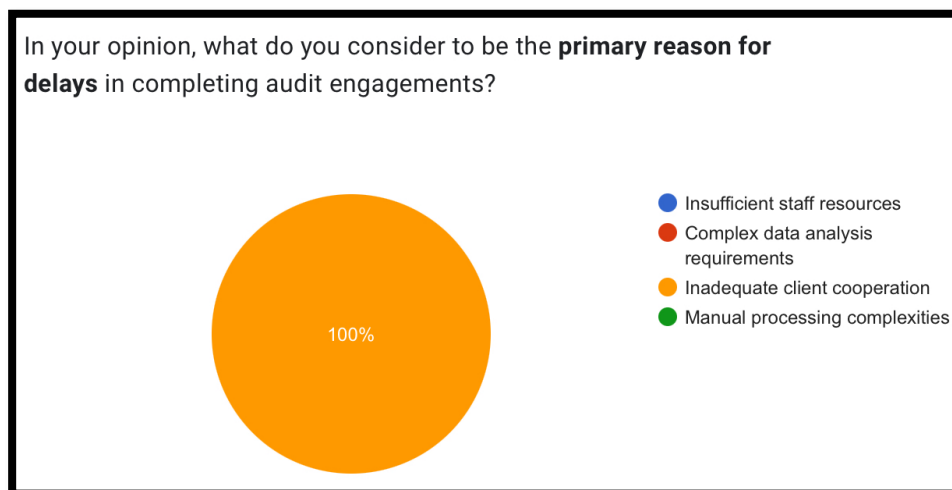


FIGURE 11. Delays

According to the analysis of the responses, AI would most preferably be seen in 3 main areas; historical data analysis, testing, and communicating audit findings to the client. What surprised the author was that all 10 interviewees admitted that they handle complex data analysis manually using spreadsheet. In big corporations, the datasets to be dealt with are extremely vast and vague, no doubt why this would be among the biggest burdens for auditors. Half of the respondents

said that they would like the provision of accurate predictive analytics to be automated, whereas the other half prioritised the automation of data analysis for risk identification.

Research done earlier in this report, provides evidence that the company already makes use of AI tools and software. Thereby, the interviewer asked the employees to name some of the most useful ones (for them and their responsibilities). Among the most common responses was Alteryx, Abi bot, Connect, and Aura.

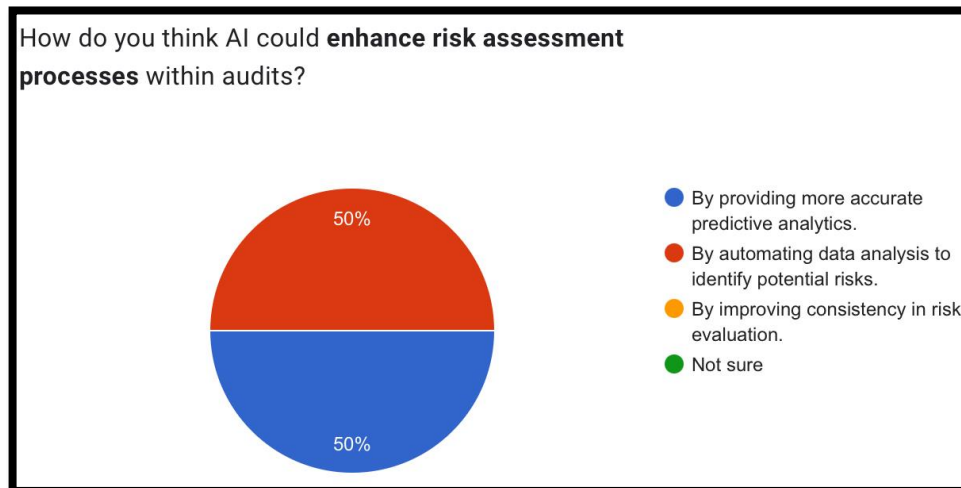


FIGURE 12. Risk Assessments

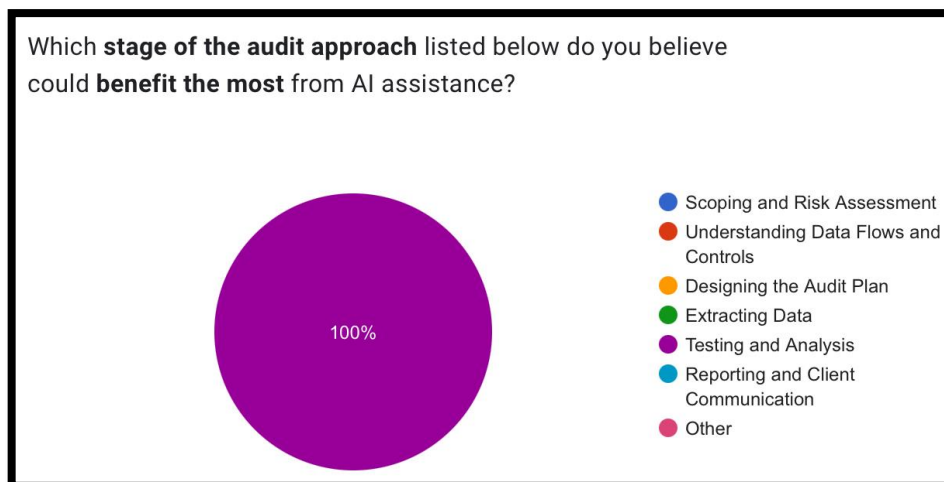


FIGURE 13. Stages of Audit

While AI can automate many tasks, according to the interviewees, there are some certain areas where human judgement remains irreplaceable. Regulatory interpretations and client interactions necessitate human expertise and critical thinking abilities. Implementing AI solutions in such fields could cause more harm than

good, and eventually lead to undesired results. Thus, it is essential to delineate between tasks that can be automated and those that require human expertise, ensuring that AI complements rather than supplants human intelligence.

The author then continued to conversation by asking the employees how they perceive the role of auditors with the increasing integration of AI technologies. While some stated that auditors will have more strategic and analytical responsibilities, others were uncertain and find it difficult to express themselves.

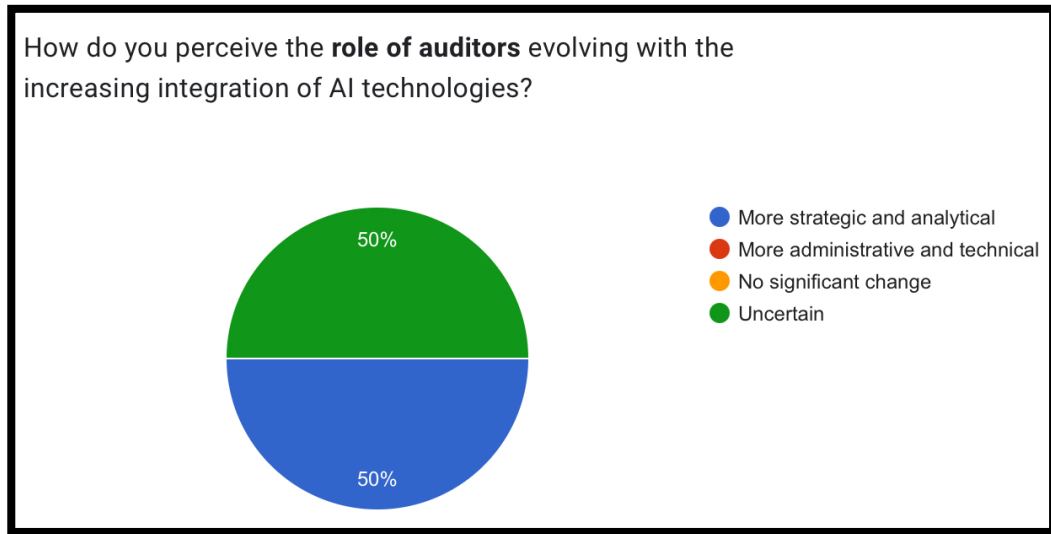


FIGURE 14. Role of Auditors

Before ending the conversation, the author wanted to ensure that there is a metric or a specific expectation that the employees base their satisfactory level on. When asked “From your perspective, what would be the key criteria for evaluating the success of AI implementation in audit-related procedures?”, the employees gave the same answer in different variations: “*increased efficiency and productivity in conducting audits*”.

7 THE AI INTEGRATION GUIDE

7.1 AI integration and mitigation strategy

The aim of the AI integration strategy is to enhance efficiency, accuracy, and insights for the auditing services at PwC Cyprus. Below, Figure 15 illustrates the AI integration strategy tailored to the needs and concerns of the audit department at PwC Cyprus. The first step two steps have been covered throughout this report, that is assessing the current audit procedures and identifying AI use cases. The following step is data integration and preparation. Data from various sources, including historical data, forecasted data, etc., needs to be structured for consistency, longevity, and with quality. This would then allow for the selection of the right and corresponding AI tools and software. So, based on the identified use cases and data requirements, AI tools such as ML algorithms, NLP and RPA tools can now be implemented.

It is important, after identifying needs and concerns to develop AI models tailored to specific audit tasks and objectives, and train then using historical audit data for accurate predictions and anomaly detection. Equally important is to test and validate these models to ensure accuracy, reliability, and compliance with audit standards. Conducting pilot audits or simulations could be one way of assessing effectiveness. Once the foundation work has been completed and the AI models have been developed, audit teams should be trained adequately on the AI tools and methodologies, emphasising on the benefits and facilitating smooth overall adoption across the organisation.

The strategy needs to have an “ongoing” nature, meaning that the company should continuously monitor and evaluate AI-driven audit processes, gather feedback, and adjust model and workflows to better align with needs, increase productivity, and improve performance. Overall, it is necessary to ensure that AI integration complies with regulatory and ethical guidelines, as well as addressing concerns for instance data privacy, security, bias, and transparency.

AI Integration Strategy

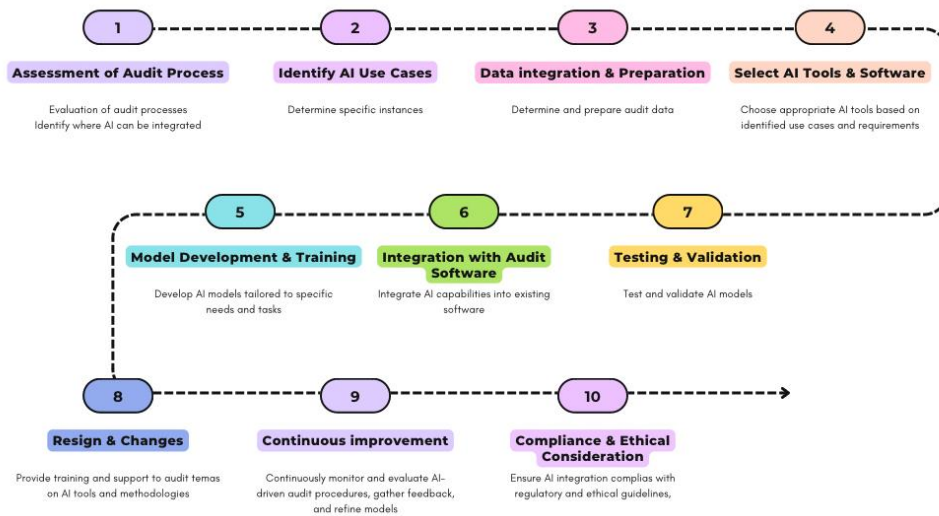


FIGURE 15. AI Integration Strategy

7.2 Practical recommendations

PwC Cyprus has an incredible potential to revolutionise established methodologies, improve processes, and provide more value to client by integration AI into audit procedures. By isolating the different elements mentioned by the interviewees, the author has been able to examine each one of them in more detail and create a concrete plan for integration AI successfully. It must be noted that for the purposes of this thesis, the *AI INTEGRATION GUIDE* does not aim to solve problems within the organisation, but instead provides practical recommendations for increasing operational efficiency through the power of AI tools and technologies.

Repetitive tasks like preparing lead sheets and bank/secretary letters would highly be benefited from automation. AI-driven technologies could extract necessary information from financial documents, generate templates, and utilise pattern recognition to enhance accuracy over time. By automating these repetitive tasks, auditors could reset their focus towards more strategic activities, such as client engagement.

PwC Cyprus should focus on further enhancing its AI software by investing in new features and more recent technologies. For instance, for the execution of JETs, adopting techs like ML algorithms, natural language processing (NLP) and RPA which all focus on pattern recognition and predictive analytics. The IT team should develop data preprocessing pipelines to handle cleaning, normalisation, and transformation tasks. Standardising data formats and resolving inconsistencies across different sources would enhance notably the performance of the algorithm.

Moreover, AI algorithms should align with the unique characteristics of JETs. Training ML learning models using historical data to identify patterns and risk factors is one option. Also, fine-tuning algorithms allows for detection of anomalies, abnormal transactions, or potential fraud implications specific to audit engagements. The overall testing and analysis phase would benefit from a fully automated testing system that streamlines procedures. This is done already to some extent within Aura Platform, but there is still a lot of room for improvement on the software.

Developing workflows that automatically analyse large datasets of journal entries, pending lists, bank statements, and secretary letters is a core feature of the AI tools to be incorporated into audit procedures. Of course, it is essential to establish a continuous monitoring system to evaluate the performance of AI platforms over time. It would also be useful to implement feedback loops that capture auditors' input and insights to refine and further improve the algorithm.

Delays resulting from client cooperation and pending list preparation could be mitigated again through AI driven solutions. For example, AI-powered project management systems could automatically track deadlines, send reminders to clients, and flag overdue tasks. Part of this is already happening, but not to a useful degree. Moreover, machine learning algorithms could analyse historical data to predict potential disruptions and allocate resources more effectively, reducing overall delays in completing audit engagements. In this case, particularly reinforcement machine learning algorithm would most benefit the operational flow. As mentioned in earlier chapters, reinforcement learning focuses on pattern recognition and has a predictive nature. By applying this method, for instance, to

tackle the conflict with pending lists, auditors would be less occupied with sending reminders and instead working on more delicate tasks.

Moving on, addressing pain points like deciding on sample selections for materiality requires a strategic approach. AI could assist auditors by analysing historical financial data, identifying key risk indicators, and suggesting appropriate sampling methodologies based on statistical analysis. Also, natural language processing algorithms, as discussed in literature review, could review audit documentation, extract relevant information, and provide insights to facilitate decision-making, empowering auditors with data-driven recommendations.

Measuring the success of AI incorporation requires an evaluation framework encompassing efficiency gains, employee satisfaction, and client satisfaction. KPIs such as time saved on repetitive tasks, reduction in human error rates, and client feedback scores provide tangible metrics for assessing the impact of AI on audit effectiveness. Employee satisfaction serves as the backbone of organisational readiness and acceptance of AI integration efforts.

7.3 Areas of future research

Some areas that are worth of further research are those of Ethical Implications and Long-term Impacts of AI Integration. It is substantial to explore the ethical considerations surrounding the integration of AI in audit practices and be up to date with new rules and regulations of accounting standards. Worth to analyse are also the long-term impacts of AI integration: audit methodologies, client relationships, and business competitiveness. Monitoring the evolution of audit services in this ever-evolving digital, and forecasting future trends in AI adoption, and cultivating an overall proactive mindset can help mitigate its implications and unprecedented risks.

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APPENDICES

Appendix 1. Interview Questions

1. Can you describe the typical workflow involved in conducting audits at PwC?
2. During an audit engagement/review, how much time do you spend on repetitive tasks?
3. Can you name some of these repetitive tasks?
4. In your opinion, what do you consider to be the primary reason for delays in completing audit engagements?
5. Which of the current audit-related procedures do you consider being the most time-consuming or labor-intensive at PwC?
6. Can you give any examples of AI tools or technologies that have already been implemented in audit procedures at PwC?
7. Can you give any examples of AI tools or technologies that have already been implemented in audit procedures at PwC?
8. What are the key challenges or pain points in audit procedures that you believe AI could address effectively?
9. Which tasks of an audit review do you prefer to be automated through AI?
10. How do you usually handle complex data analysis during audits?
11. Which stage of the audit approach listed below do you believe could benefit the most from AI assistance?
12. What are your primary concerns regarding the integration of AI into audit procedures?
13. In your opinion, are there any other risks or limitations associated with the use of AI in audit procedures?
14. How do you perceive the role of auditors evolving with the increasing integration of AI technologies?

15. How often do you come across with instances where human error significantly impacts the efficiency or accuracy of audit procedures?
16. In your opinion, is there any sector/task that the implementation of AI should be avoided at all costs?
17. How do you think AI could enhance risk assessment processes within audits?
18. From your perspective, what would be the key criteria for evaluating the success of AI implementation in audit-related procedure?