



THE IMPACT OF AUDIT AUTOMATION ON THE INFORMATION TECHNOLOGY (IT) AUDIT PROFESSION (A CASE OF A SOUTH AFRICAN AUDIT FIRM)

by

LYDIA DLAMINI (929481)

SUPERVISOR: DR THEMBEKILE MAYAYISE

Research Report

Submitted in partial fulfilment of the requirements for the degree of
Master of Commerce (Information Systems)
in the
School of Business Sciences,
Faculty of Commerce, Law, and Management,
University of the Witwatersrand

Date of submission

27 FEBRUARY 2025

Declaration regarding Plagiarism

I declare that this is my own unaided work and is, to the best of my knowledge and belief, original.

I have read and understood the Senate policy on plagiarism and am aware that plagiarism is the intentional or unintentional “failure to acknowledge the ideas or writing of another” or “presentation of the ideas or writing of another as one’s own.” In this context “other” means any other person including a student, academic, professional, published author or other resource such as the internet. Failing to acknowledge the use of ideas of others constitutes an important breach of the values and conventions of the academic enterprise.

I am aware that plagiarism offences will be dealt with in terms of Senate policy and may be subject to disciplinary action.

I (full names & surname):	Lydia Casilda Dlamini
Student number:	929481

Declare the following:

1. I understand what plagiarism entails and am aware of the University’s policy in this regard.
2. I declare that this assignment is my own, original work. Where someone else’s work was used (whether from a printed source, the Internet, or any other source) due acknowledgement was given and reference was made according to departmental requirements.
3. I did not copy and paste any information directly from an electronic source (e.g., a web page, electronic journal article or CD ROM) into this document.
4. I did not make use of another student’s previous work and submitted it as my own.
5. I did not allow and will not allow anyone to copy my work with the intention of presenting it as his/her own work.



Signature

27/02/2025

Date

TABLE OF CONTENTS

1	CHAPTER ONE – INTRODUCTION	1
1.1	BRIEF BACKGROUND TO THE TOPIC.....	1
1.2	PROBLEM STATEMENT	2
1.3	RESEARCH QUESTIONS AND OBJECTIVES.....	3
1.4	SIGNIFICANCE OF THE STUDY	3
2	CHAPTER TWO – LITERATURE REVIEW	4
2.1	INTRODUCTION.....	4
2.2	IT AUDITING.....	4
2.3	AUDIT AUTOMATION	5
2.4	IMPACT OF AUDIT AUTOMATION IN IT AUDITING.....	5
2.5	IMPACT OF DATA ON THE USE OF AUTOMATED IT AUDITING PROCESSES.....	6
2.6	GAPS IN THE LITERATURE REVIEWED	8
2.7	THEORETICAL AND CONCEPTUAL FRAMEWORK	17
2.7.1	RESEARCH MODEL/Framework	19
3	CHAPTER THREE – RESEARCH METHODOLOGY	24
3.1	INTRODUCTION.....	24
3.2	RESEARCH PHILOSOPHY (PARADIGM) AND APPROACH	24
3.3	RESEARCH DESIGN AND STRATEGY	25
3.4	POPULATION AND SAMPLE	25
3.4.1	POPULATION.....	25
3.4.2	SAMPLING METHOD	25
3.5	RESEARCH INSTRUMENT	26
3.6	PROCEDURE FOR DATA COLLECTION	26
3.7	DATA ANALYSIS AND INTERPRETATION	27
3.8	RIGOUR.....	29
3.9	ETHICAL CONSIDERATIONS	30
4	CHAPTER FOUR – PRESENTATION OF THE FINDINGS	31
4.1	INTRODUCTION.....	31
4.2	CONTEXT OF THE STUDY	31
4.3	THEMES PRESENT AND FINDINGS OF THE STUDY	33
5	CHAPTER FIVE – DISCUSSION OF THE FINDINGS	57
5.1	INTRODUCTION.....	57
5.2	CHAPTER CONCLUSION	62

6	CHAPTER SIX – CONCLUSION AND RECOMMENDATIONS.....	64
6.1	CONCLUSION	64
6.2	RESEARCH LIMITATIONS	64
6.3	RECOMMENDATIONS FOR FUTURE RESEARCH	65
7	REFERENCES.....	66
8	APPENDIX A: RESEARCH INSTRUMENT	68
9	APPENDIX B: CONSISTENCY TABLE.....	69
10	APPENDIX C: CONSENT FORM	71
11	APPENDIX D: ETHICS CLEARANCE.....	72
12	APPENDIX E: TURNITIN REPORT SUMMARY	73

THE IMPACT OF AUDIT AUTOMATION ON THE INFORMATION TECHNOLOGY (IT) AUDIT PROFESSION (A CASE OF A SOUTH AFRICAN AUDIT FIRM)

ABSTRACT

Organisations are moving towards the automation of business processes to meet the demands of stakeholders. To meet the frequency and expectations of businesses, IT audits should be automated to ensure that organisation's auditing/accounting practices, risk controls, compliance and information systems, and business controls are reviewed on an ongoing basis. Additionally, the IT profession is evolving as a result of the audit automation. This qualitative case study explores the impact of audit automation on the IT audit profession, focusing on how automation influences their day-today responsibilities and competencies.

The study follows an interpretivism paradigm where semi-structured interviews were conducted with 21 IT auditors from a South African audit firm. The interview questions were derived from a model built from the systematic literature review conducted for the study and the affordance theory adopted for the use of Information Systems research. The data was analysed using thematic coding, which identified key themes such as data as an enabler, continuous auditing and continuous monitoring, audit automation and the role of the IT auditor.

Findings indicate that although the IT audit role is evolving, it will not be fully replaced by automation anytime soon, IT auditors will work together with audit automation tools to act as information certifiers of the results from the audit automation tools. Their key role will be to apply their professional judgement and professional scepticism which audit automations tools currently lack.

The study concludes that IT auditors and audit firms should invest in training and upskilling to ensure that they have the relevant skills to work together with audit automation tools. This study contributes to the understanding of how IT auditors perceive and adapt to automation and the evolving responsibilities, offering insights to practitioners and audit firms on how they can upskill and provide the relevant training to IT auditors. Future research should focus on the role of artificial intelligence on the automation of the audit profession and the capabilities and impacts that AI has on the audit profession.

Keywords: IT Audit, IT audit profession, automation, affordance theory, technology adoption theories, audit automation, auditing, process automation, artificial intelligence

1 CHAPTER ONE – INTRODUCTION

1.1 BRIEF BACKGROUND TO THE TOPIC

Organisations are moving towards the automation of business processes to meet the demands of stakeholders. To meet the frequency and expectations of businesses, IT audits should be automated to ensure that organisation's auditing/accounting practices, risk controls, compliance and information systems, and business controls are reviewed on an ongoing basis (Vasarhelyi, Alles, Kuenkaikaew, & Littlely, 2012). To ensure the advancement of audit in organisations, their audit procedures must be automated (Vasarhelyi, Alles, Kuenkaikaew, & Littlely, 2012).

Traditional audits are audits where there is intensive human labor without the assistance of audit automation tools or heavy reliance on any tools (Eulerich, Masli, Pickered, & Wood, 2023; Vasarhelyi, Alles, Kuenkaikaew, & Littlely, 2012). Automated audits are an improvement from traditional audits as 1) well-defined and repetitive tasks are completed in less time (Frey & Osborne, 2017; Huang & Vasarhelyi, 2019; Huerta & Jensen, 2017; Pizzi, Venturelli, Variale, & Macario, 2021) 2) Continuous auditing and continuous monitoring are driven by audit process automation (Huang & Vasarhelyi, 2019) and enabled by data (Frey & Osborne, 2017; Huang & Vasarhelyi, 2019; Pizzi, Venturelli, Variale, & Macario, 2021), 3). Most risks that impact the organisation such as fraud risk and security risks are mitigated accordingly with early detection from the automation driven by the use of data (Setty & Rohit, 2013; Titera, 2013), 4) Fraud risk in organisations is mitigated by the use of automation and data analytics to proactively detect or identify fraud before it happens or as it occurs (Appelbaum, Kogan, & Vasarhelyi, 2017; Eulerich, Masli, Pickered, & Wood, 2023; Huerta & Jensen, 2017; Pizzi, Venturelli, Variale, & Macario, 2021) 5) Furthermore, there are fewer human errors as there is limited professional judgment required due to the reliance of automation and resulting reports (Huang & Vasarhelyi, 2019; Zhang, Thomas, & Vasarhelyi, 2022).

Therefore, the study's purpose is to explore and understand the perceptions and experiences of IT auditors on IT audit automation, examine concerns, challenges, and benefits. This helps understand what the impact of automation is on the IT audit profession, what the role of the IT auditors is, how this benefits audit firms in South Africa and explore emerging innovations and trends because of IT audit automation.

1.2 PROBLEM STATEMENT

Business process automation is the computerisation or automation of complex business processes or procedures using advanced technologies (Gartner, 2022). An IT Audit is the review of information systems to provide assurance or advice on the design and adequacy of the information systems reviewed and their operating effectiveness over a specified period (Deloitte, 2022). The purpose of IT audits is to ensure that there are controls in place to mitigate risks in the IT environment and that those controls mitigate the inherent risk such that the residual risk (remainder of risk) is at its minimum (Deloitte, 2022). Process automation in IT audit entails the automation of audit procedures such that well-defined and repetitive tasks are automated (Huang & Vasarhelyi, 2019). IT audit mainly uses robotic process automation (RPA) to automate these well-defined and repetitive audit procedures (Huang & Vasarhelyi, 2019; Zhang, Thomas, & Vasarhelyi, 2022).

The earliest form of the automation of audit procedures was identified in the beginning of the 1990's and was coined as electronic data processing (EDP) (Kogan, Sudit, & Vasarhelyi, 1999; Vasarhelyi, 1993). As a result, process automation in audits has been applied in all types of auditing including IT audits in both an external and internal audit point of view where external audits focus on the finances of the organisation per statutory requirements while internal audits focus on the operations of the organisation (Deloitte, 2022).

Based on the reviewed literature covering a three decades of research (Rowe, 2014), no recent studies have been conducted on IT audits in the African region. While some studies were empirical, (Chan & Vasarhelyi, 2011; Kogan, Sudit, & Vasarhelyi, 1999; Pizzi, Venturelli, Variale, & Macario, 2021; Rikhardsson & Dull, 2016; Vasarhelyi, 1993; Zhang, Thomas, & Vasarhelyi, 2022) a few were conceptual, and this study aims to narrow the gap and make a methodological and contextual contribution through the empirical case study undertaken in the African context. Furthermore, the studies have highlighted the advantages of audit process automation such as frequent reviews with a proactive approach where volumes of information can be audited continuously (Chan & Vasarhelyi, 2011; Kogan, Sudit, & Vasarhelyi, 1999; Pizzi, Venturelli, Variale, & Macario, 2021; Rikhardsson & Dull, 2016; Vasarhelyi, 1993; Zhang, Thomas, & Vasarhelyi, 2022) and have also highlighted all the requirements that should be met to enable this automation (Alles & Gray, 2020; Chan & Vasarhelyi, 2011; Huang & Vasarhelyi, 2019; Kogan, Sudit, & Vasarhelyi, 1999; Pizzi, Venturelli, Variale, & Macario, 2021; Vasarhelyi, 1993; Zhang, Thomas, & Vasarhelyi, 2022). However, it was noted there are limited studies on the impact of audit automation on IT auditors or the IT audit profession.

Problem Statement

Despite the extensive research on business process automation and its application in IT audits, there is a notable gap in recent empirical studies focusing on the African region, particularly concerning the impact of audit automation on IT auditors and the IT audit profession. This study aims to address this gap by exploring the methodological and contextual implications of audit process automation in the African context, thereby contributing to the understanding of how IT audit process automation can enhance audit procedures and the IT audit profession's evolution.

1.3 RESEARCH QUESTIONS AND OBJECTIVES

Purpose Statement

The purpose of this research is to explore the impact of the automation of audit procedures in IT audit or the IT audit profession by focusing on the following objective:

To determine the impacts of IT audit automation on IT audit/IT audit profession.

Research Questions

Based on the research objectives this research aims to address the following research questions:

What impact does the automation of IT audit processes have on IT auditors/IT audit profession?

The sub-research questions that aim to answer the main research question are as follows:

Q1: How does data (data access, data analytics/data modelling and big data) affect the application of automation in IT auditing?

Q2: How does the IT audit process automation affect the IT audit profession in IT auditing?

Q3: What is the effect of affordances as a result of audit automation on the IT audit process in IT auditing?

Q4: What is the effect of affordances as a result of audit automation on the IT audit profession?

1.4 SIGNIFICANCE OF THE STUDY

The study helps to explore the impact of audit automation on IT auditors as most studies have highlighted the advantages of audit process automation such as frequent reviews with a proactive approach where volumes of information can be audited continuously (Chan & Vasarhelyi, 2011; Kogan, Sudit, & Vasarhelyi, 1999; Pizzi, Venturelli, Variale, & Macario, 2021; Rikhardsson & Dull, 2016; Vasarhelyi, 1993; Vasarhelyi, Alles, Kuenkaikaew, & Littley, 2012) and have also highlighted all the requirements that should be met to enable this automation (Alles & Gray, 2020; Chan & Vasarhelyi, 2011; Huang & Vasarhelyi, 2019; Huerta & Jensen, 2017; Rikhardsson & Dull, 2016; Pizzi, Venturelli, Variale, & Macario, 2021).

However, it was noted there are limited studies on the impact of audit automation on IT auditors or the IT audit profession in the South African context. Furthermore, there are limited studies on the value of IT audit, the effort required to perform full-scope audits with limited resources. Therefore, this study explores the relevant theories and/or models to understand the impact of the automation of IT audit on the IT audit profession. This also helps understand the impact of using audit automation and how it can empower audit firms to best leverage the capabilities of IT audit automation.

2 CHAPTER TWO – LITERATURE REVIEW

2.1 INTRODUCTION

This chapter outlines the review of the related literature for the study and the theoretical models and frameworks. The chapter outlines what IT audit entails, what audit automation is and what the role of the IT auditor looks like. Furthermore, continuous auditing and continuous monitoring are covered as part of impacts of audit automation on IT audit. Additionally, data as an enabler of audit automation is discussed. Details of the systematic literature review and gaps are discussed. Additionally, a conceptual framework developed as part of the systematic literature review, information systems theories and the affordance theory are discussed. The review included peer reviewed journal articles that had a full text available. The studies also had to be in the English language. The studies also had to be thirty years old as, (Rowe, 2014) states that going back to 30 years is beneficial when conducting a systematic literature review where first pieces of the research are included. The study should contain automation and auditing to be included. The review excluded any research that was conducted before 1993. Additionally, it excluded work that was not peer reviewed and without full text available for download/extraction. Furthermore, work without any references was also excluded from the literature review.

2.2 IT AUDITING

IT Audit is the review of information systems to provide assurance or advice on the design and adequacy of the information systems reviewed and their operating effectiveness over a specified period (Deloitte, 2022). In traditional audits, IT auditors perform the testing and reporting, where audit procedures are labour intensive and therefore, samples are utilised for the testing (Chan & Vasarhelyi, 2011; Vasarhelyi, Alles, Kuenkaikaew, & Littley, 2012; Zhang, Thomas, & Vasarhelyi, 2022). Audit process automation may result in the automation of most audit processes, however, it should be noted that the following tasks cannot yet be automated 1) perception and manipulation tasks, where the tasks consists of an unstructured work environment; 2) Creative intelligence tasks where creativity is required to perform tasks and; 3) social intelligence tasks, where negotiation, persuasion and care are required to carry out the tasks (Frey & Osborne, 2017; Huang & Vasarhelyi, 2019; Zhang, Thomas, & Vasarhelyi, 2022).

This means that audit tasks such as being innovative or creative to make daily audit tasks better cannot be automated. Additionally, the auditing of unstructured data cannot be automated. Furthermore, social intelligent tasks such as negotiation and persuasion (used during negotiations when findings of audits are presented to process owners) cannot be automated. Therefore, auditors can work together with audit automation tools to ensure efficiency in the audit process (Kogan, Sudit, & Vasarhelyi, 1999; Huerta & Jensen, 2017). Automation can be used for repetitive tasks that do not require human judgement and for pattern recognition in proactive auditing (Huang & Vasarhelyi, 2019). Furthermore, auditors can focus on tasks that require professional judgement (Huang & Vasarhelyi, 2019; Zhang, Thomas, & Vasarhelyi, 2022), additionally, they can upskill themselves to obtain data analytical skills (Huerta & Jensen, 2017) where they play the role of an

information worker/data certifier who analyses results from audit automation tools and give audit assurance to the organisation.

2.3 AUDIT AUTOMATION

The earliest form of automation in auditing was identified in the 90's and was referred to as the electronic data processing (EDP) (Kogan, Sudit, & Vasarhelyi, 1999; Vasarhelyi, 1993). Since then, audit automation has matured and has been applied in the auditing field for the automation of audit procedures. The automation of audit processes has resulted in the emergence of audit concepts such as continuous auditing (CA) and continuous monitoring (CM), where the auditing/accounting practices, risks and controls, compliance monitoring, information systems auditing, and business controls evaluations are reviewed on an ongoing basis (Appelbaum, Kogan, & Vasarhelyi, 2017; Eulerich, Masli, Pickered, & Wood, 2023; Huerta & Jensen, 2017; Pizzi, Venturelli, Variale, & Macario, 2021). The use of robotic process automation (RPA) has also been adopted in audit process automation, where well-defined, repetitive tasks are automated (Huang & Vasarhelyi, 2019). Furthermore, data analysis, data modelling, big data, data availability for robotic process automation and business intelligence were identified as enablers of the automation of audit processes, these were unpacked further in section 2.5.

2.4 IMPACT OF AUDIT AUTOMATION IN IT AUDITING

Automation of tasks requires that they should be well-defined and repetitive (Frey & Osborne, 2017; Huang & Vasarhelyi, 2019), they should also be easily programmable (Frey & Osborne, 2017). However, it has also been noted that non-routine cognitive tasks can be replaced by automation (Alles & Gray, 2020; Frey & Osborne, 2017; Zhang, Thomas, & Vasarhelyi, 2022). Big data is used, where data algorithms are employed to replace tasks that require the storage and access of information and pattern recognition (Frey & Osborne, 2017). Audit has a combination of procedures that are well-defined, repetitive, and non-routine cognitive tasks, and it also relies on data storage and data access of information where pattern recognition is used in the proactive audit approach. This therefore means that automation of audit processes could pose a risk of replacing the audit profession.

Continuous auditing and continuous monitoring have evolved the way in which traditional audits are performed as they are a result of audit automation (Chan & Vasarhelyi, 2011; Kogan, Sudit, & Vasarhelyi, 1999; Pizzi, Venturelli, Variale, & Macario, 2021; Rikhardsson & Dull, 2016; Vasarhelyi, 1993). Traditional audits are performed on a periodic basis, e.g., yearly; the audit approach is reactive where issues are picked up after they have materialised; the audit procedures used are manual in nature; the role of auditors entails manual labour where samples are selected from the full population to conduct testing; the results of the tests done by auditors are also reported periodically when the audit happens (Chan & Vasarhelyi, 2011; Vasarhelyi, Alles, Kuenkaikaew, & Littley, 2012).

In contrast to traditional audits, continuous audits happen on a frequent basis, e.g., monthly, weekly, daily, or real time depending on the needs of the organisation; the audit approach is proactive where potential issues are picked up before they materialise; audit procedures are automated; data analytics and data modelling are used for testing where full populations are mostly

used for testing; the results of the testing are reported on a frequent basis as per the organisation's needs (Chan & Vasarhelyi, 2011; Vasarhelyi, Alles, Kuenkaikaew, & Littley, 2012).

Based on the above, it can be deduced that automation is a driver for continuous auditing and that the automation of audit processes brings rise to benefits in the audit process. The benefits include cost reduction on audit engagements as less auditors are needed on audits to carry out testing (Rikhardsson & Dull, 2016), additionally there is high productivity as data modelling and data analytics are used to carry out audits instead of intensive manual labour (Huang & Vasarhelyi, 2019; Kogan, Sudit, & Vasarhelyi, 1999; Rikhardsson & Dull, 2016).

Furthermore, continuous audits are proactive, meaning picking up issues before they materialise is cost saving to the organisation and operational and reputational risks are addressed before they have a significant impact on the organisation (Alles & Gray, 2020; Chan & Vasarhelyi, 2011; Pizzi, Venturelli, Variale, & Macario, 2021; Rikhardsson & Dull, 2016). Automated audits also mitigate the risk of human error (Alles & Gray, 2020; Caster, Elder, & Janvrin, 2021; Chan & Vasarhelyi, 2011; Huang & Vasarhelyi, 2019; Vasarhelyi, Alles, Kuenkaikaew, & Littley, 2012), the automated nature of audit processes means that populations or samples that are tested, are tested the same way all the time, unlike human based tests where there may be inconsistencies and errors on some of the tests performed.

Although there are benefits realised from automating audit processes, it was noted that there are also some disadvantages. Auditors must be familiar with the use of audit automating tools (Chan & Vasarhelyi, 2011; Huerta & Jensen, 2017) which means that organisations must invest in the training and development of their audit staff which might increase costs. Additionally, the automation of audit processes may lead to limited interaction with the auditee, where audit results are automatically sent to the auditee without human interaction which may lead to a disconnect between the auditee and audit department (Alles & Gray, 2020; Kogan, Sudit, & Vasarhelyi, 1999). Although automation has a lot of advantages within the audit field, it is believed that human interaction would still be required (Alles & Gray, 2020; Kogan, Sudit, & Vasarhelyi, 1999), which means that auditors would have to use data as an enabler of automation to better their jobs or audit tasks. The possibility of automating audit procedures is also driven by the availability of data for automation (Alles & Gray, 2020; Huang & Vasarhelyi, 2019; Huerta & Jensen, 2017; Pizzi, Venturelli, Variale, & Macario, 2021).

2.5 IMPACT OF DATA ON THE USE OF AUTOMATED IT AUDITING PROCESSES

Access to appropriate data sets that are stored electronically are required for audit process automation (Huang & Vasarhelyi, 2019; Kogan, Sudit, & Vasarhelyi, 1999; Rikhardsson & Dull, 2016; Vasarhelyi, Alles, Kuenkaikaew, & Littley, 2012). Audit automation is considered matured when there are advances in the data quality and there is complete data access in an audit data warehouse (Rikhardsson & Dull, 2016; Vasarhelyi, Alles, Kuenkaikaew, & Littley, 2012). Furthermore, data collection must be standardised to avoid having to manually clean data before it is usable for auditing, the manual labour for cleaning data will decrease the efficiencies and benefits realised from automated audit processes (Chan & Vasarhelyi, 2011). Additionally, data

must be compatible with software that will be used for automation, and it must be structured to avoid high error rates and processing costs (Huang & Vasarhelyi, 2019).

Data modelling and data analytics have long been utilised on traditional audits where statistical techniques were used for analytical procedures (Chan & Vasarhelyi, 2011; Dzurainin & Malaescu, 2016; Titera, 2013). However, in automated audits, data modelling and data analytics techniques are utilised in the form of data mining and machine learning techniques for testing predictive controls in the proactive audit approach (Chan & Vasarhelyi, 2011; Pizzi, Venturelli, Variale, & Macario, 2021). It was noted that an increase in the data quality and integrity used for audit automation, resulted in more the confidence placed on the data for decision making and reporting in audits which added to the quality and efficiency of reporting (Rikhardsson & Dull, 2016; Vasarhelyi, Alles, Kuenkaikaew, & Little, 2012).

Big data has been identified as one of the drivers of audit process automation (Alles & Gray, 2020; Caster, Elder, & Janvrin, 2021; Frey & Osborne, 2017; Huang & Vasarhelyi, 2019; Huerta & Jensen, 2017; Pizzi, Venturelli, Variale, & Macario, 2021), however, the use of big data also brings rise to other concerns (Huerta & Jensen, 2017). One of the concerns is that auditors may assume that results deduced from the use of big data are free of bias which may be incorrect as cognitive biases of the decision maker cannot be eliminated, additionally, system biases may be built into the system used for big data (Huerta & Jensen, 2017). It should be noted that these biases are not limited to big data, they may also be applicable in data analysis and data modelling. Furthermore, the use of data for automation has been deemed to pose the risk of replacing the audit profession (Frey & Osborne, 2017; Huerta & Jensen, 2017), this was discussed on section 2.3 of this research report.

2.6 GAPS IN THE LITERATURE REVIEWED

This section discusses the literature reviewed for this study and the gaps identified in the literature review. A systematic literature review was performed to review prior studies that have been conducted on IT audit automation and its impact on the IT audit profession.

Table 1 provides a summary of the selected studies based on the attributes; reference, context of the study, purpose of the study, methods used, demographics/level of study, concepts examined, key findings, and limitations. It should be noted that some of the studies identified are not limited to IT audit, however, their concepts can also be applied to IT auditing.

Table 1: Summary of studies identified from the systematic literature review performed for this research.

Reference	Context	Purpose of study	Methods used	Demographics/ Level of study	Variables/ concepts examined	Key Findings	Limitations
(Vasarhelyi, 1993)	The implementation of the (ADAPT) audit automation tool.	Describing the implementation of the ADAPT audit automation tool.	• Interpretivist • Inductive • Qualitative • Descriptive	Audit functions (both external and internal)	• Continuous Auditing / Monitoring • Audit Process Automation	Continuous auditing may be a result of the use of audit automation tools.	Limited to the ADAPT tool for audit automation.
(Kogan, Sudit, & Vasarhelyi, 1999)	Research on online continuous auditing.	Exploring the effects of continuous online auditing.	• Interpretivist • Inductive • Qualitative • Descriptive	Continuous online auditing (as an IT artefact)	• Continuous Auditing/ Monitoring • Audit Process Automation • Data access • Data analytics/ modelling • IT audit profession automation • Role of auditor	As technology advances, the frequency of audits may also increase at lower costs.	Limited to the automation of continuous auditing online. Automation is also not limited IT audit it covers the broad audit.
(Chan & Vasarhelyi, 2011)	Practice of continuous auditing.	Exploring continuous online auditing	• Interpretivist • Inductive • Qualitative	Continuous auditing (as an IT artefact)	• Continuous Auditing/ Monitoring	Automation of audits has led to the improvement of	Limited to audit automation as a dimension of

Reference	Context	Purpose of study	Methods used	Demographics/ Level of study	Variables/ concepts examined	Key Findings	Limitations
		as an audit innovation.	• Descriptive		• Audit Process Automation • Data analytics/ modelling • Role of auditor	traditional audits and has enabled continuous auditing.	continuous auditing.
(Vasarhelyi, Alles, Kuenkaikaew, & Littley, 2012)	The acceptance and adoption of continuous auditing by internal auditors.	Explore effects of continuous auditing in small businesses.	• Interpretivist • Inductive • Qualitative • Interviews	Internal audit managers and internal audit staff in 9 internal audit organisations	• Continuous Auditing/ Monitoring • Audit Process Automation • Data access • Data analytics/ modelling	Some organisations have already adopted continuous auditing while others are looking for more advanced technologies for their audits.	Limited to the adoption and acceptance of continuous auditing by internal auditors.
(Titera, 2013)	Application of data analytics on audit standards	Explains the role and value of data analysis in the audit process.	• Interpretivist • Qualitative • Explanatory	American Institute of Certified Public Accountants (AICPA) board	• Continuous Auditing/ Monitoring • Audit Process Automation • Data analytics/ modelling	The study recommends a detailed analysis and provides guidance to changing audit standards for data analysis.	Limited to the American Institute of Certified Public Accountants (AICPA) board.
(Dzuranin & Malaescu, 2016)	Challenges and opportunities in IT audit.	Exploring emerging topics in IT audit.	• Interpretivist • Qualitative • Exploratory	Academic researchers and practitioners	• Continuous Auditing/ Monitoring • Audit Process Automation • Data analytics/ modelling	Outlines concerns facing auditors regarding the use of big data.	Limited to the big data and audit analytics in the external audit context.

Reference	Context	Purpose of study	Methods used	Demographics/ Level of study	Variables/ concepts examined	Key Findings	Limitations
(Rikhardsson & Dull, 2016)	Impact of continuous auditing in small businesses.	Exploring the factors that influence the adoption of continuous auditing in small businesses.	• Interpretivist • Inductive • Qualitative • Observation	Auditing functions within small organisations	• Continuous Auditing/ Monitoring • Audit Process Automation • Data access • Data analytics/ modelling	Continuous auditing is usually seen as solution for data quality issues and inefficiencies as opposed to being a technology strategy aligned solution.	Limited to the adoption and use of continuous auditing in small businesses.
(Huerta & Jensen, 2017)	Big data and data analytics as an audit automation enabler.	Exploring the effects of applying data analytics for audit automation.	• Interpretivist • Inductive • Qualitative • Exploratory	Academics and practitioners	• Audit Process Automation • Data analytics/ modelling • Big data • Role of auditor	Automation enabled by big data may bring rise to new career opportunities in the audit space.	Limited to big data as an enabler of automation in financial audits.
(Frey & Osborne, 2017)	The future of professions and their susceptibility due to computerization.	Examines the susceptibility of professions because of automation.	• Positivist • Deductive • Quantitative • Relational	702 Occupations/ professions	• Data analytics/ modelling • Big data • IT audit profession automation • Role of auditor	Automation is no longer limited to well-defined repetitive tasks, with big data as an enabler, it can now be applied on non-cognitive tasks where pattern recognition can be used to replace occupations that consist of non-routine cognitive tasks.	Limited to predictions regarding tasks/ equipment that can be operated using automation and their expectation to perform.

Reference	Context	Purpose of study	Methods used	Demographics/ Level of study	Variables/ concepts examined	Key Findings	Limitations
(Huang & Vasarhelyi, 2019)	Framework for using robotic process automation in audit.	Examines the application of robotic process automation in auditing.	• Interpretivist • Inductive • Qualitative • Exploratory	Robotic process automation (RPA) (as an IT artefact)	• Audit Process Automation • Data access • Data analytics/ modelling • Big data • IT audit profession automation • Role of auditor	Insights on human and technology related issues were discovered where cost saving was also identified as a benefit of audit automation.	Limited to the use of robotic process automation in the confirmation process for financial audits.
(Alles & Gray, 2020)	Framework for understanding the automation of audit processes.	Examines the automations of the audit practice.	• Interpretivist • Inductive • Qualitative • Exploratory	Audit automation (as an IT artefact)	• Audit Process Automation • Data analytics/ modelling • Big data	A framework for technology as an input in audit processes was developed.	Limited to the automation of financial audit processes.
(Pizzi, Venturelli, Variale, & Macario, 2021)	An analysis of impacts on internal audit due to digital transformation.	Analyses the impacts of the automation of audit.	• Interpretivist • Inductive • Qualitative • Exploratory	Digital transformation (as an IT artefact)	• Continuous Auditing/ Monitoring • Audit Process Automation • Data analytics/ modelling • Big data	The following research areas were highlighted as part of the study; continuous auditing, data analytics, fraud and technological innovation.	Limited to audit automation literature that was reviewed at the time and excludes conference proceedings as part of the audit automation literature review.
(Caster, Elder, & Janvrin, 2021)		Investigates the effects of automation on	• Interpretivist • Inductive • Qualitative	• Longitudinal dataset from the largest	• Audit Process Automation • Big data	Automation of the audit confirmation	Limited to the automation of the bank

Reference	Context	Purpose of study	Methods used	Demographics/ Level of study	Variables/ concepts examined	Key Findings	Limitations
		the confirmation process.	• Exploratory • Longitudinal study supplemented by interviews • Secondary data	third-party U.S. confirmation service provider • Practitioners		process results in less errors by auditors.	confirmation process.
(Zhang, Thomas, & Vasarhelyi, 2022)	Attended Process Automation in Audit: A Framework and A Demonstration	Exploring auditor's roles in RPA enabled audits.	• Exploratory • Qualitative	• APA Framework demonstration	• Role of auditor • Audit Process Automation	Professional judgement is not replaceable by automation.	Limited to external audit functions.
(Eulerich, Masli, Pickered, & Wood, 2023)	The Impact of Audit Technology on Audit Task Outcomes: Evidence for Technology-Based Audit Techniques	Explore impacts of audit technology on audit task outcomes.	• Interpretivist • Qualitative • Interview	• Interviews with Chief Audit Executives (CAEs)	• Audit Process Automation • Data Analytics	Use of technology audits results in efficiencies and higher costs.	Limited to internal audit functions.

The systematic literature review performed revealed that several studies have identified continuous auditing (CA) and continuous monitoring (CM) as a benefit of audit automation (Chan & Vasarhelyi, 2011; Kogan, Sudit, & Vasarhelyi, 1999; Pizzi, Venturelli, Variale, & Macario, 2021; Rikhardsson & Dull, 2016; Vasarhelyi, 1993; Vasarhelyi, Alles, Kuenkaikaew, & Littlely, 2012). CA and CM are results of audit automation where the frequency of auditing is increased (Chan & Vasarhelyi, 2011; Vasarhelyi, Alles, Kuenkaikaew, & Littlely, 2012). CA and CM as a result of audit automation have changed the way in which traditional audits are performed, where audits are performed frequently instead of periodically, audit procedures are automated instead of manual, full population testing is performed instead of sample selection and reporting also happens frequently (Chan & Vasarhelyi, 2011; Vasarhelyi, Alles, Kuenkaikaew, & Littlely, 2012). Based on the reviewed literature it can be noted that audit process automation is the main driver of CA and CM and brings rise to many benefits in the IT audit process such as cost reduction in running IT audit engagements (Rikhardsson & Dull, 2016), reduced human error as IT auditors are not performing a lot of manual tasks (Alles & Gray, 2020; Caster, Elder, & Janvrin, 2021; Chan & Vasarhelyi, 2011; Huang & Vasarhelyi, 2019) and audits are proactive where risks are identified before they materialise (Chan & Vasarhelyi, 2011; Vasarhelyi, Alles, Kuenkaikaew, & Littlely, 2012).

The literature also revealed that the automation of IT audit processes is enabled by data and this data has to be accessible and stored electronically (Huang & Vasarhelyi, 2019; Kogan, Sudit, & Vasarhelyi, 1999; Rikhardsson & Dull, 2016; Vasarhelyi, Alles, Kuenkaikaew, & Littlely, 2012). The literature also revealed that for the audit automation process to be mature, there should be advances in quality of data used for the automation process (Rikhardsson & Dull, 2016; Vasarhelyi, Alles, Kuenkaikaew, & Littlely, 2012). The literature further revealed that data analytics and data modelling were used before the concept of audit automation was introduced where traditional statistical procedures were used for audit processes requiring analysis (Chan & Vasarhelyi, 2011). However, it has been noted that in advanced data analytical audit methods, techniques such as data mining and machine learning are used to aid the process of IT audit automation (Rikhardsson & Dull, 2016; Vasarhelyi, Alles, Kuenkaikaew, & Littlely, 2012). Furthermore, it has been identified that big data has also significantly contributed to the audit automation process where different types of data (structured and unstructured) can be accessed to extract value adding business and IT audit insights (Alles & Gray, 2020; Caster, Elder, & Janvrin, 2021; Frey & Osborne, 2017; Pizzi, Venturelli, Variale, & Macario, 2021).

Frey and Osborne (2017) predicted that there is a 94% probability that the audit profession will be computerised/automated and subsequent to the study other researchers have implied to agree with this prediction (Huang & Vasarhelyi, 2019). This prediction was made on a basis that automation is no longer limited to repetitive and well-defined task, as big data can now be used to automate non-routine cognitive tasks where algorithms are applied to replace tasks that encompass storage and access of information/knowledge and pattern recognition (Alles & Gray, 2020; Frey & Osborne, 2017). Such automation would then change the role of the IT auditor who would be more of an information worker responsible for interpreting the output for the IT audit automation tools (Frey & Osborne, 2017).

Although the studies focused on the benefits of audit automation and data as an enabler, there was little or no discussion of the impacts of audit automation on IT auditors or the IT audit profession. Table 2 is a summary of the concepts identified on the reviewed literature. It supports the identified pattern on the lack of discussion or contribution regarding the IT audit profession or the role of the IT auditor as a result of IT audit automation. This study therefore focuses on the impact of IT audit automation on IT auditors or the IT audit profession.

Table 2: Concept matrix summarising concepts examined on the reviewed literature.

Articles	Concepts						
	The audit process		Data			The IT audit profession	
	Continuous Auditing (CA)/ Continuous Monitoring (CM)	IT Audit process automation	Data Access	Data Analytics/ Data Modelling	Big Data	IT Audit profession Automation	Role of IT Auditor
(Vasarhelyi, 1993)	*	*					
(Kogan, Sudit, & Vasarhelyi, 1999)	*	*	*	*		*	*
(Chan & Vasarhelyi, 2011)	*	*		*			*
(Vasarhelyi, Alles, Kuenkaikaew, & Little, 2012)	*	*	*	*			
(Titera, 2013)	*	*	*	*	*		
(Dzuranin & Malaescu, 2016)	*	*	*	*	*		
(Rikhardsson & Dull, 2016)	*	*	*	*			
(Huerta & Jensen, 2017)		*		*	*		*
(Frey & Osborne, 2017)				*	*	*	*

Articles	Concepts						
	The audit process		Data			The IT audit profession	
	Continuous Auditing (CA)/ Continuous Monitoring (CM)	IT Audit process automation	Data Access	Data Analytics/ Data Modelling	Big Data	IT Audit profession Automation	Role of IT Auditor
(Huang & Vasarhelyi, 2019)		*	*	*	*	*	*
(Alles & Gray, 2020)		*		*	*		
(Pizzi, Venturelli, Variale, & Macario, 2021)	*	*		*	*		
(Caster, Elder, & Janvrin, 2021)		*			*		
(Zhang, Thomas, & Vasarhelyi, 2022)		*				*	*
(Eulerich, Masli, Pickered, & Wood, 2023)		*		*		*	

2.7 THEORETICAL AND CONCEPTUAL FRAMEWORK

Based on the literature reviewed for this research, there were no explicit theories discussed however, there were concepts identified. These concepts can be divided into three main concepts with sub-concepts namely, 1) The audit process consisting of 1a) Continuous Auditing (CA)/ Continuous Monitoring (CM) and 1b) audit process automation; 2) Data consisting of 2a) data access and 2b) Data Analytics/ Data Modelling and 2c) Big data and 3) the IT audit profession consisting of 3a) IT audit profession automation and 3b) Role of IT auditor. These are discussed further in section 2.7.1 of this research report where a model was developed to address the research question and research objective. Refer to table 2 for a detailed view of the concepts examined and the respective studies.

A high-level review of socio-technical Information Systems (IS) theories was conducted, as Mkhomazi & Iyamu, 2013 suggest that socio-technical IS theories are key to underpinning IS research. A theory that could potentially address the research question and research objective is the Diffusion of Innovation Theory (DOI) which aims to explain how innovations are accepted by a population within a specified context (Mkhomazi & Iyamu, 2013). However, this theory does not fully address the research question and research objective as it focuses on explaining the acceptance or rejection of the innovation in a specified context (Mkhomazi & Iyamu, 2013) it does not explain the impact of the use of the innovation after the acceptance therefore it was not used for this study.

Another theory that was reviewed is the Technology Acceptance Model (TAM) which aims to explain the relationship between perceived usefulness (PU) and perceived ease of use (PEOU) where users are more likely to adopt a system if they perceive it to improve their work (Momami, Jamous, & Hilles, 2018). Another theory that was reviewed is the Unified Theory of Acceptance and Use of Technology (UTAUT) which is the expansion of TAM to include performance expectancy, effort expectancy, social influence and facilitating conditions as key adoption factors (Venkatesh, Morris, Davis, & Davis, 2003). However, the theories do not fully address the research question and objective as they do not explore the impact of the use of the technology after the acceptance has occurred and were not selected for this study.

Furthermore, the Socio-Technical Systems (STS) theory was reviewed. This theory argues that successful technology adoption requires balancing technical and social factors and highlights that users have to be involved in the system design and organisational alignment during the system implementation phase (Tatnall, 2023). However, this theory does not fully address the research question and objective as it focuses on pre-implentation factors of teachnology use and acceptance and was not selected for this study.

Other theories that were reviewed include the Actor-Network Theory (ANT) which views technology adoption as a result of interactions between humans and software/hardware and explains how it is more likely for a system to be adopted if it aligns user needs and workflows (Doolin & Lowe, 2002). Additionally, the Task-Technology Fit (TTF) model was reviewed. IT

aims to explain that technology adoption depends on how well it fits the tasks it is meant to support, similar to ANT it suggests that it is more likely for a system to be adopted if it aligns to the user needs and workflows (Goodhue & Thompson, 1995). However, these theories do not fully address the research question and objective as they focus on adoption factors that are task and workflow based instead of the impacts of the adoption of the technology.

Additionally, the Institutional Theory was reviewed, which argues that technology adoption is determined by external pressures such as governments, industry norms, competitors and cultural expectations where organisations may adopt systems to maintain legitimacy instead of gaining efficiencies (DiMaggio & Powell, 1983). This theory does not fully address the research question and objective as focuses on organisational external factors for technology adoption instead of impacts as a results of the adoption. Another theory reviewed was the Resistance to Change theory, which explains that technology adoption can be slowed by psychological resistance, organisational inertia and lack of user training (del Val & Fuentes, 2018). However, this theory does not fully address the research question and objective as it focuses on change management strategies during technology adoption.

An additional theory that was reviewed which would best address the research question and research objective is the Affordance Theory. It aims to explain the relationship between the technology and the user/human actor (Wang, Wang, & Tang, 2018). This theory is best fit to address the research question and research objective as it can help understand how auditors are impacted by the affordance provided by audit automation. Furthermore, the theory can be used to explore both the organisational and individual aspects of the effects of the affordances/ lack of (Wang, Wang, & Tang, 2018).

It can be noted that several theories could potentially address the objective and questions posed on this research report, however, only two were selected and discussed to comprise the theoretical framework of this research report, these include 1) A model that was developed as a result of the concepts identified on the systematic literature review performed for this research report which addresses the research question and research objective and 2) The Affordance Theory. These theories/frameworks and their respective constructs are discussed further in section 2.7.1.

2.7.1 RESEARCH MODEL/Framework

Model developed from systematic literature review of this research report

Table 2 of this research report summarises concepts/ key themes that were identified as a result of the systematic literature review conducted for this research report. It was noted that there are three concepts containing sub-concepts that were identified namely, 1) The audit process consisting of 1a) Continuous Auditing (CA)/ Continuous Monitoring (CM) and 1b) audit process automation; 2) Data consisting of 2a) data access and 2b) Data Analytics/ Data Modelling and 2c) Big data and 3) the IT audit profession consisting of 3a) IT audit profession automation and 3b) Role of IT auditor.

As discussed on the background literature of this research report, it was noted that data is the main enabler of IT audit automation and as a result affects the audit process or how IT audits are conducted. This in turn has an impact in the IT audit profession. The relationships identified from the literature review can be explained by figure 1. Refer to the literature review of this research report for the detailed background of the identified concepts examined from literature. The linkage of this model and the affordance theory is discussed further and represented by figure 3.

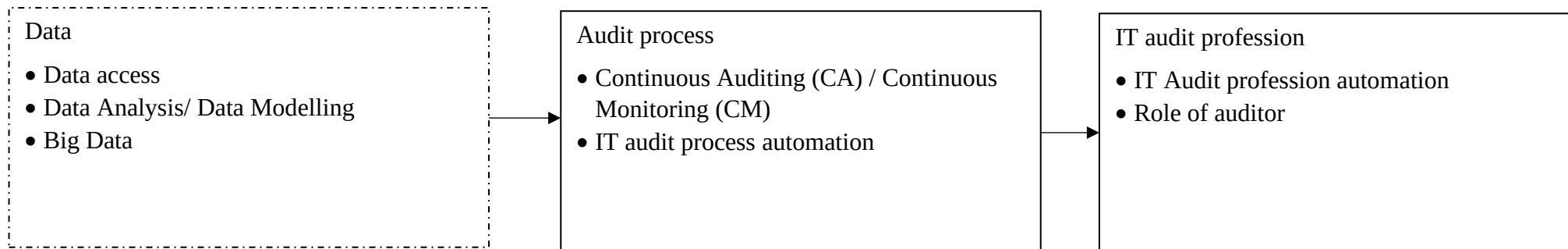


Figure 1: Model developed from key themes/concepts of the systematic literature review conducted for this research

Affordance Theory

The affordance theory was first developed in 1977 by Gibson to understand how an object in an environment can afford an actor possibilities of meeting a goal based on the context of the perceived goal (Volkoff & Strong, 2017). In the Information Systems research context, the affordance theory has been contextualised to understand the relationship between the technology and the human actor (Mkhomazi & Iyamu, 2013) in this research report the relationship between the IT auditor (organisational perspective) and the IT audit automation (IT artefact).

The affordance theory can also be used to identify the effects of affordances/ lack of as a result of the interaction between the human actor (IT auditor) and the technology (IT audit automation) (Mkhomazi & Iyamu, 2013). Figure 2 below explains the theoretical framework that can be used to understand the effects of these affordances. The framework below also considers the organisational lens of effects of the affordances (recognition process and behaviour of the IT auditors).

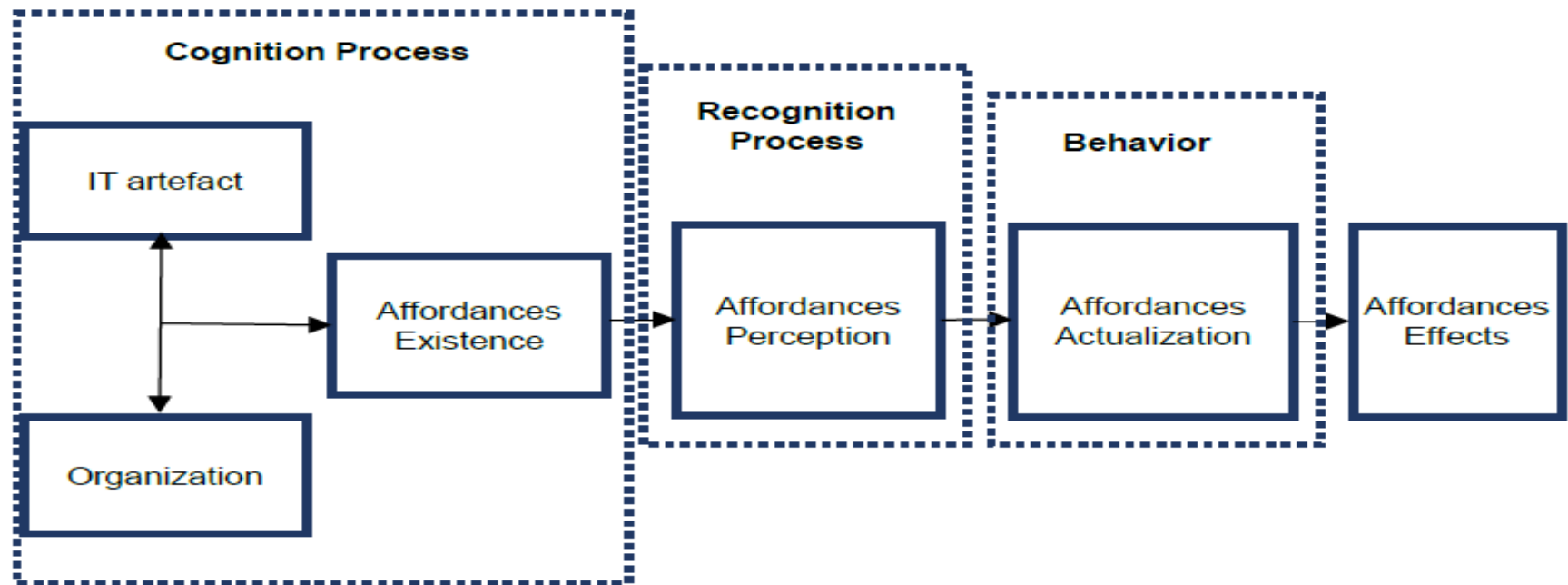


Figure 2: Theoretical framework of affordances in Information Systems as depicted by Wang, et al., (2018, p. 62)

The framework consists of four concepts that include the 1) cognition process which is made up of the IT artefact, organisation and affordances existence; 2) the recognition process which includes the affordances perception; the behavior which consists of affordances actualisation and 4) the affordances effects. Refer to table 3 for the concepts identified.

Table 3: Themes used to code the transcribed interviews adapted from the model developed in the literature review of this study and the theoretical framework of affordances in Information Systems as depicted by Wang, et al., (2018, p. 62)

Concept	Sub-concept	Definition
Data	Data Access	Automation of IT audit processes is enabled by data and this data must be accessible and stored electronically (Huang & Vasarhelyi, 2019; Kogan, Sudit, & Vasarhelyi, 1999; Rikhardsson & Dull, 2016; Vasarhelyi, Alles, Kuenkaikaew, & Littley, 2012).
	Data Analysis/Data Modelling	Advanced data analytical audit methods, techniques such as data mining and machine learning are used to aid the process of IT audit automation (Rikhardsson & Dull, 2016; Vasarhelyi, Alles, Kuenkaikaew, & Littley, 2012).
	Big Data	Big data is a significant contributor to the audit automation process where different types of data (structured and unstructured) can be accessed to extract value adding business and IT audit insights (Alles & Gray, 2020; Huang & Vasarhelyi, 2019; Huerta & Jensen, 2017; Pizzi, Venturelli, Variale, & Macario, 2021).
Audit Process	Continuous Auditing (CA) / Continuous Monitoring (CM)	Continuous Auditing (CA) and Continuous Monitoring (CM) as a benefit of audit automation (Chan & Vasarhelyi, 2011; Rikhardsson & Dull, 2016; Vasarhelyi, Alles, Kuenkaikaew, & Littley, 2012).
	Audit Process Automation	Automated audits are an improvement from traditional audits as 1) well defined and repetitive tasks are completed in less time (Frey & Osborne, 2017; Huang & Vasarhelyi, 2019; Huerta & Jensen, 2017; Pizzi, Venturelli, Variale, & Macario, 2021).
IT Audit Profession	IT Audit Profession Automation	The automation of the IT audit profession (Eulerich, Masli, Pickered, & Wood, 2023; Pizzi, Venturelli, Variale, & Macario, 2021; Rikhardsson & Dull, 2016; Zhang, Thomas, & Vasarhelyi, 2022).

Concept	Sub-concept	Definition
	Role of Auditor	The role of the IT auditor given the automation of the IT audit profession (Huerta & Jensen, 2017; Kogan, Sudit, & Vasarhelyi, 1999).
Cognition Process	IT Artefact	The IT artefact based on the context of the study (Wang, Wang, & Tang, 2018).
	Organisation	The organisation based on the context of the study (Wang, Wang, & Tang, 2018).
	Affordances Existence	The cognitive process of where the human actor perceives potential affordances when interacting with IT artefacts (objects) (Wang, Wang, & Tang, 2018).
Recognition Process	Affordances Perception	The recognition of the existence of affordances per the perception of the potential affordances (Wang, Wang, & Tang, 2018).
Behaviour	Affordances Actualisation	The interaction with IT artefact by human actors to realise affordances (Wang, Wang, & Tang, 2018).
N/A	Affordances Effects	Effects achieved as a result of the actualisation of affordances by human actors (Wang, Wang, & Tang, 2018).

Linking of frameworks and model

Concepts from figure 2 were identified from the systematic literature review conducted for this research report. These concepts were further grouped to develop a model per figure 3 of this research report. A framework for the automation of the audit process as identified in figure 3 was identified as per Huang & Vasarhelyi, (2019) and can guide how the automation of the IT process is conducted and the extent of the automation. The affordances that are a result of this automation can also be explained using figure 3 as guideline which in turn explains the effects of the affordances. Figure 3 depicts these relationships.

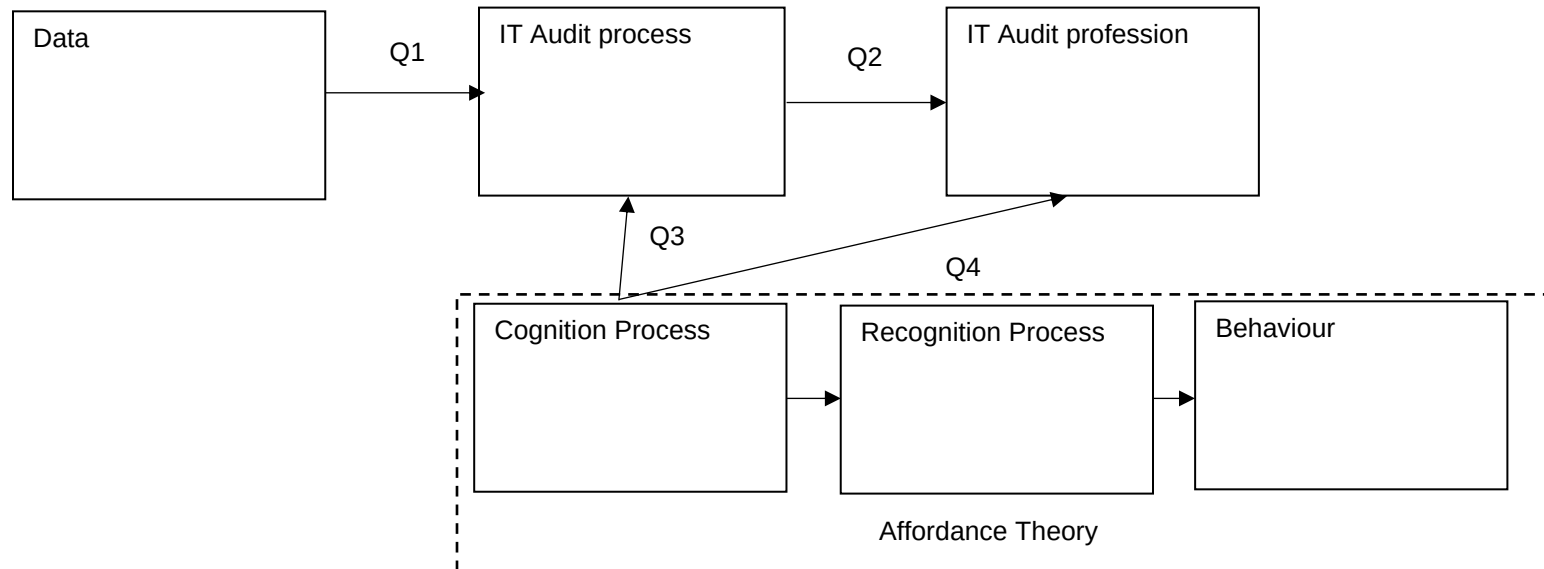


Figure 3: Conceptual framework of the study

3 CHAPTER THREE – RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter outlines the methodology used in the research, it defines all methodological terms used and justifies all methods selected for the study. The chapter will cover the research philosophy and approach, the design and strategy, population and sampling, the research instrument used to conduct the interview questions, data analysis procedures, the research rigour, and ethical considerations.

3.2 RESEARCH PHILOSOPHY (PARADIGM) AND APPROACH

The research followed the interpretivism paradigm. Interpretivism is a philosophical paradigm where the world is viewed with subjectivity where knowledge creation/research is conducted based on people's subjective perceptions of the world (Oates, Griffiths, & McLean, 2022). Ontology is how the nature of the world/reality is viewed (Oates, Griffiths, & McLean, 2022). In the interpretivism paradigm, the world is viewed as subjective reality where the reality is dependent on people's perceptions. This means that based on the interpretivism paradigm there are multiple realities. This paradigm is therefore the best approach to addressing the objectives and questions of this research as it captures the different perspectives of the different IT auditors who formed part of the study.

Epistemology is how knowledge creation/research is performed on the way reality is viewed (Oates, Griffiths, & McLean, 2022). In the interpretivist paradigm the subjective reality cannot be understood/measured objectively (Oates, Griffiths, & McLean, 2022). Therefore, interpretivist research aims to understand why certain people act the way they do and why they perceive some concepts the way they do (Oates, Griffiths, & McLean, 2022) which can yield multiple subjective results based on the individuals/groups assessed and how they perceive certain concepts. This therefore assisted with addressing the objectives and research questions of the study by understanding the perceptions of IT auditors regarding the automation of audit procedures.

Interpretivist research focuses mostly on qualitative research which critically analyses people's subjective understanding on phenomena (Oates, Griffiths, & McLean, 2022). The results on the interpretivism paradigm are not generalisable on the greater population. Smaller samples of a selected population are usually selected where the data collected is not structured as it entails subjective responses of the different subjects. Interviews are a data collecting method that can be used in social science research following the interpretivism paradigm. The interpretivism paradigm relies on inductive research where theories are developed using new empirical data (Bhattacharjee, 2012). This research aims on identifying further concepts that may impact the IT audit profession/ IT auditors due to audit automation which may bring rise to new theories/models, or which may add to the underpinning research framework of this research. Therefore, based on the nature of this research, the sample size of the IT auditors is 21 which avoids data saturation while also ensuring variability and a comprehensive understanding of the phenomenon being studied (Guest, Bunce, & Johnson, 2006; Malterud, Siersma, & Guassora, 2015).

3.3 RESEARCH DESIGN AND STRATEGY

This research utilised a qualitative case study. Qualitative data is data that includes non-numeric data such as words, pictures, and sounds (Oates, Griffiths, & McLean, 2022). Case studies are studies that focus on a single phenomenon that is under assessment such as a department or organisation (Oates, Griffiths, & McLean, 2022). Having defined qualitative data and case study separately, a qualitative case study can be defined as a study that focuses on one instance of a single phenomenon by using non-numeric data techniques such as words, pictures, sounds, etc. This research focused on one department within an audit firm in South Africa. The case involves an IT audit department which uses audit automation tools for their IT audits. The impact of using these tools has not been explored, this study helps explore impacts that the audit automation has on the IT auditors within this department in a South African audit firm.

There are three basic types of case studies namely, exploratory, descriptive, and explanatory (Oates, Griffiths, & McLean, 2022). An exploratory study is used to define question or hypotheses that are to be used in a future study and is usually selected when there is limited literature on the selected phenomenon of study (Oates, Griffiths, & McLean, 2022). Therefore, this type of case study can be considered if there is not enough literature regarding the phenomenon under review. A descriptive study is used to derive a detailed analysis of the selected phenomenon and details observed occurrences and subject's perspectives on how they view the observed occurrences (Oates, Griffiths, & McLean, 2022). Therefore, this type of case study can be considered when analysing and detailing the perceptions on the use of a certain IT artefact.

An explanatory study is like a descriptive study; however, it goes further by identifying multiple factors that affected the phenomenon being assessed and comparing them with theories from the literature and identifying the best theory for the phenomenon being assessed (Oates, Griffiths, & McLean, 2022). Therefore, this type of case study would be considered when identifying multiple factors that affect the phenomenon under review. Based on the definitions of the qualitative case studies, the type of case study that best address the research objectives and questions is the exploratory study as there is limited literature that focuses on the effects of audit automation of IT auditors/IT audit profession.

3.4 POPULATION AND SAMPLE

3.4.1 POPULATION

A population is a complete group of individuals with similar characteristics that a sample can be selected from to draw conclusions (Bhattacharjee, 2012). The population for this study entails all the IT auditors within an IT audit department in a South African audit firm.

3.4.2 SAMPLING METHOD

Sampling is a statistical process where a subset is selected from a population of interest for the purpose of collecting data or making observations and statistical conclusions on the population (Bhattacharjee, 2012). The sampling process includes identifying the population, which is the group

of interest that the statistical conclusions can be generalisable to (Bhattacharjee, 2012). It includes the sampling frame, which is the list that the sample can be selected from and the sample, which is the which consist of the selected unit of analysis (Bhattacharjee, 2012). In this research, the population is IT auditors within a department at a South African audit firm. The research used purposive sampling, which is a non-probability sampling technique where respondents are selected based on their expertise (Bhattacharjee, 2012). Opinions from experts are more credible than those provided by non-experts (Bhattacharjee, 2012). IT auditors were selected for this study as they are more likely to provide expert/credible responses on their perception of IT audit automation. A sample size of 21 IT auditors was selected to avoid data saturation while also ensuring variability and a comprehensive understanding of the phenomenon being studied (Guest, Bunce , & Johnson, 2006; Malterud, Siersma, & Guassora, 2015).

3.5 RESEARCH INSTRUMENT

The instrument/survey was assessed for validation and refined before data was collected. A panel of experts (The university's proposal defence panel) was used to confirm content and face validity of the questions used. Face validity refers to whether an indication is a justifiable measure of a concept at face value and content validity refers to how well scale concepts match with content that the concept is intending to measure (Bhattacharjee, 2012). After the instrument was developed and tested, pilot testing was conducted to further refine the research instrument. Pilot testing is important in the research process as it detects potential issues in the research design or instrumentation which ensures the validity and reliability of the concepts (Bhattacharjee, 2012). For this study, two (2) IT auditors were interviewed before the pilot-testing to ensure that the questions asked were clear and concise, no significant changes were made to the research instrument. Pilot-testing was conducted with one (1) IT auditor, question 1a) was adjusted to add that data is an enabler for automation. Refer to Appendix A for the instrument used for this study.

3.6 PROCEDURE FOR DATA COLLECTION

Interviews are a data collecting method that can be used in social science research following the interpretivism paradigm (Bhattacharjee, 2012). The interviews contained both open-ended (unstructured) and closed-ended (structured) questions and were semi-structured where a section of the interview contained questions that required pre-defined answers (Bhattacharjee, 2012). The data was collected using semi-structured interviews with 21 IT auditors at an IT audit department a South African audit firm.

Permission to interview IT auditors in a department at a South African audit firm was obtained from the department's business unit leader. The interviewees were contacted via email and those who are interested were selected to participate in the study. The interviews were recorded using Microsoft Teams. Participants' consent was obtained before the interviews.

The data was collected following an inductive strategy where questions were derived from the underpinning framework of this research. The interview questions were based on Q1-Q4 proposed on the literature review section of this research report:

Q1: How does data (data access, data analytics/data modelling and big data) affect the application of automation in IT auditing?

Q2: How does the IT audit process automation affect the IT audit profession in IT auditing?

Q3: What is the effect of affordances as a result of audit automation on the IT audit process in IT auditing?

Q4: What is the effect of affordances as a result of audit automation on the IT audit profession in IT auditing?

3.7 DATA ANALYSIS AND INTERPRETATION

Qualitative data is composed of non-numerical data such as words, pictures, or sounds and can be generated from interview recordings, websites, research diaries, etc. (Oates, Griffiths, & McLean, 2022). Before analysing the qualitative data, it must be prepared (Oates, Griffiths, & McLean, 2022). Data preparation is the process of getting data ready for analysis, where data is grouped/presented in a similar format (Oates, Griffiths, & McLean, 2022). For this research report, interview recordings were transcribed to ensure that collected data is in a similar format that can be easily analysed.

After the data was transcribed, data analysis took place. Post reading all the transcribed data, key themes can be identified (Bhattacharjee, 2012; Oates, Griffiths, & McLean, 2022). Oates, et al. 2022, suggest using three themes during initial stages of analysis which include, 1) segments that are not relevant to the study, 2) segments that provide descriptive information for the context of the research and, 3) segments that may be relevant to address the research questions of the research (Oates, Griffiths, & McLean, 2022). After the initial analysis, segments from theme 3 can be further categorised into different themes (Oates, Griffiths, & McLean, 2022). Some of the categories identified can be broken down into sub-categories (Oates, Griffiths, & McLean, 2022).

Post categorisation, an analysis of interconnections and themes between segments and categories was made (Oates, Griffiths, & McLean, 2022). The use of visual aids such as tables helped with the categorisations (Oates, Griffiths, & McLean, 2022).

The data analysis process was documented step-by-step to ensure that the conclusions reached are justifiable and the analysis can be followed/understood. The concepts were derived from the systematic literature review conducted for this research report where a model with three main concepts was derived. Furthermore, the affordance theory adapted for information systems studies was used which also has three (3) main concepts. Table 4 outlines the key themes used to code the data collected from the interviews with the 21 IT auditors.

Table 4: Themes used to code the transcribed interviews adapted from the model developed in the literature review of this study and the theoretical framework of affordances in Information Systems as depicted by Wang, et al., (2018, p. 62)

Concept	Sub-concept	Definition
Data	Data Access	Automation of IT audit processes is enabled by data and this data must be accessible and stored electronically (Huang & Vasarhelyi, 2019; Kogan, Sudit, & Vasarhelyi, 1999; Rikhardsson & Dull, 2016; Vasarhelyi, Alles, Kuenkaikaew, & Littley, 2012).
	Data Analysis/Data Modelling	Advanced data analytical audit methods, techniques such as data mining and machine learning are used to aid the process of IT audit automation (Rikhardsson & Dull, 2016; Vasarhelyi, Alles, Kuenkaikaew, & Littley, 2012).
	Big Data	Big data is a significant contributor to the audit automation process where different types of data (structured and unstructured) can be accessed to extract value adding business and IT audit insights (Alles & Gray, 2020; Huang & Vasarhelyi, 2019; Huerta & Jensen, 2017; Pizzi, Venturelli, Variale, & Macario, 2021).
Audit Process	Continuous Auditing (CA) / Continuous Monitoring (CM)	Continuous Auditing (CA) and Continuous Monitoring (CM) as a benefit of audit automation (Chan & Vasarhelyi, 2011; Rikhardsson & Dull, 2016; Vasarhelyi, Alles, Kuenkaikaew, & Littley, 2012).
	Audit Process Automation	Automated audits are an improvement from traditional audits as 1) well defined and repetitive tasks are completed in less time (Frey & Osborne, 2017; Huang & Vasarhelyi, 2019; Huerta & Jensen, 2017; Pizzi, Venturelli, Variale, & Macario, 2021).
IT Audit Profession	IT Audit Profession Automation	The automation of the IT audit profession (Eulerich, Masli, Pickered, & Wood, 2023; Pizzi, Venturelli, Variale, & Macario, 2021; Rikhardsson & Dull, 2016; Zhang, Thomas, & Vasarhelyi, 2022).
	Role of Auditor	The role of the IT auditor given the automation of the IT audit profession (Huerta & Jensen, 2017; Kogan, Sudit, & Vasarhelyi, 1999).
Cognition Process	IT Artefact	The IT artefact based on the context of the study (Wang, Wang, & Tang, 2018).
	Organisation	The organisation based on the context of the study (Wang, Wang, & Tang, 2018).
	Affordances Existence	The cognitive process of where the human actor perceives potential affordances when interacting with IT artefacts (objects) (Wang, Wang, & Tang, 2018).
Recognition Process	Affordances Perception	The recognition of the existence of affordances per the perception of the potential affordances (Wang, Wang, & Tang, 2018).

Behaviour	Affordances Actualisation	The interaction with IT artefact by human actors to realise affordances (Wang, Wang, & Tang, 2018).
N/A	Affordances Effects	Effects achieved as a result of the actualisation of affordances by human actors (Wang, Wang, & Tang, 2018).

3.8 RIGOUR

Rigour refers to the methods applied to ensure that the findings are credible, trustworthy, and accurately represents the participants' experiences and perceptions (Bhattacharjee, 2012; Oates, Griffiths, & McLean, 2022). The quality or rigour of an interpretivist research is measured using, trustworthiness, confirmability, dependability, credibility, and transferability (Oates, Griffiths, & McLean, 2022).

Credibility

Credibility refers to how believable the study is and if it reflects the authenticity of the participants (Bhattacharjee, 2012). "The credibility of interpretive research can be improved by providing evidence of the researcher's extended engagement in the field, by demonstrating data triangulation across subjects or data collection techniques, and by maintaining meticulous data management and analytic procedures, such as verbatim transcription of interviews, accurate records of contacts and interviews, and clear notes on theoretical and methodological decisions, that can allow an independent audit of data collection and analysis if needed." (Bhattacharjee, 2012, p. 110). In this study credibility was ensured by recording and transcribing all interviews conducted. Accurate records of contacts were also stored.

Transferability

Transferability refers to the extent to which the findings of the study can be generalisable to other cases (Bhattacharjee, 2012). This can be demonstrated by providing detailed descriptions of the research context and detailing any assumptions made from the data so that other researchers can evaluate if the reported findings are generalisable to other cases (Bhattacharjee, 2012). In this study, transferability was ensured by documenting all the findings and the corresponding quotes that the participants made to get to certain conclusions. These were broken down into themes which were also documented in detail.

Dependability

Dependability refers to the authenticity of the study where it is examined if another researcher assessing the same research phenomenon can reach the same or a similar conclusion (Bhattacharjee, 2012). This can be demonstrated by having a logical, traceable, and clearly documented study (Bhattacharjee, 2012). In this study this was ensured by documenting all the steps of the data analysis and a consistency table was used when coding the transcribed interviews. Refer to appendix B for the consistency table used.

Confirmability

Confirmability refers to the extent to which the results are based on the participants' perceptions and not the researcher's biases (Bhattacharjee, 2012). This can be demonstrated by using triangulation across data collection techniques and methods (Bhattacharjee, 2012). For this study, the data collection methods and techniques were described, and the research instrument used was derived/adopted from the literature reviewed.

Trustworthiness

Trustworthiness refers the amount of trust that can be placed on the study (Oates, Griffiths, & McLean, 2022). This can be demonstrated by ensuring that the research is credible, transferable, dependable, and confirmable (Oates, Griffiths, & McLean, 2022). For this study, this was ensured by detailing every step and process undertaken to ensure the for characteristics of trustworthiness.

3.9 ETHICAL CONSIDERATIONS

Ethical considerations refer to the protection of the participant's rights, where informed consent should be obtained via a review process by an institution and obtaining ethical approval (Klopper, 2008). Research is considered ethical when it does not bring harm to human subjects (Rosenthal, 1994). This study underwent the review process by the university to ensure that it does not violate any participant's (IT auditors) rights, and it does not harm them. This means that the participants (IT auditors) participated voluntarily in the study, meaning that they could withdraw at any point of the study without any consequences, and they remained unharmed regardless of their participation or lack of (Bhattacharjee, 2012).

The participants (IT auditors) signed a consent form before participating in the study, the consent form clearly stated their rights (including the participation being voluntary and that they could withdraw at any point of the study/interview) (Bhattacharjee, 2012). Furthermore, the participants interests were protected by ensuring that they remained anonymous, or their responses were kept confidential (Bhattacharjee, 2012). Anonymity implies that a response cannot be linked back to a participant (Bhattacharjee, 2012). Although anonymity was not fully possible in this study as the interviews included face-to-face interactions, participants were guaranteed confidentiality by making sure that none of the participant's real names or any identifying information was included in the final research report.

Participants were also given full details of the research before they could participate, as this helped them decide if they wanted to participate or not (Bhattacharjee, 2012). For this research, this information was included as part of the consent form. The purpose, outcomes and benefits of the results were outlined (Bhattacharjee, 2012). Additionally, the details of the analysis of data and reporting of results were included in the final report that participants can have access to upon request (Bhattacharjee, 2012). All results were disclosed regardless of whether they were unexpected or negative (Bhattacharjee, 2012).

In addition to the above considerations, the research was performed at the highest possible quality as Rosenthal 1994, states that low quality research is a waste of participants' time and a waste of resources which is also an ethical concern.

4 CHAPTER FOUR – PRESENTATION OF THE FINDINGS

4.1 INTRODUCTION

This section contains the context of the study based on the 21 interviews conducted and presents the findings, major themes identified and any emergent themes.

4.2 CONTEXT OF THE STUDY

The interview questions aimed to answer the four (4) sub-research questions that were derived from the literature review of the study:

Q1: How does data (data access, data analytics/data modelling and big data) affect the application of automation in IT auditing?

Q2: How does the IT audit process automation affect the IT audit profession in IT auditing?

Q3: What is the effect of affordances as a result of audit automation on the IT audit process in IT auditing?

Q4: What is the effect of affordances as a result of audit automation on the IT audit profession in IT auditing?

It can be noted that Q1-Q4 address the main objective and research questions posed on this research report.

Objective: To determine the impacts of IT audit automation on IT audit.

Main research question: What impact does the automation of IT audit processes have on IT auditors/IT audit profession?

These questions were answered by themes that were derived from the model developed from the literature review of the research report and the theoretical framework of affordances in Information Systems as depicted by Wang, et al., (2018, p. 62)

The study focused on IT Auditors within an IT audit department in a South African audit firm. Twenty-one IT auditors were interviewed. Purposive sampling was used, where IT Auditors who had availability and were willing to participate were selected. Additionally, Snowball sampling was used where some of the participants recommended other colleagues. The context of individuals interviewed is presented on Table 5. Identifiers/names of the participants have been removed to adhere to the university's confidentiality and ethics policies.

Table 5: Biographical details of participants interviewed.

Name of Participant	Job Title	Gender	Age	IT Audit Experience	Experience with IT Audit Automation Tools
Participant 1	Manager	Female	22-34	7+	7+
Participant 2	Manager	Male	35-47	7+	7+
Participant 3	Senior Consultant	Female	22-34	4+	3+
Participant 4	Senior Manager	Female	22-34	10+	10+
Participant 5	Director	Female	35-47	20+	20+
Participant 6	Senior Manager	Male	35-47	10+	10+
Participant 7	Manager	Male	35-47	4+	4+
Participant 8	Manager	Female	22-34	7+	7+
Participant 9	Senior Manager	Male	35-47	9+	9+
Participant 10	Senior Consultant	Male	22-34	5+	5+
Participant 11	Manager	Male	22-34	4+	4+
Participant 12	Manager	Female	35-47	7+	7+
Participant 13	Manager	Male	22-34	5+	5+
Participant 14	Senior Associate Director	Male	35-47	20+	20+
Participant 15	Manager	Male	22-34	8+	8+
Participant 16	Associate Director	Male	48-60	20+	20+
Participant 17	Senior Consultant	Female	22-34	4+	4+
Participant 18	Director	Male	35-47	21+	21+
Participant 19	Senior Manager	Male	35-47	14+	14+
Participant 20	Senior Manager	Male	22-34	5+	5+
Participant 21	Senior Associate Director	Male	35-47	22+	22+

4.3 THEMES PRESENT AND FINDINGS OF THE STUDY

Figure 3 outlines key themes that were identified as a result of the literature review conducted for this study. It was noted that there were three concepts containing sub-concepts that were identified namely, 1) The audit process consisting of 1a) Continuous Auditing (CA)/ Continuous Monitoring (CM) and 1b) audit process; 2) Data consisting of 2a) data access and 2b) Data Analytics/ Data Modelling and 2c) Big data and 3) the IT audit profession consisting of 3a) IT audit profession automation and 3b) Role of IT auditor. Additionally, themes from the Theoretical framework of affordances in Information Systems as depicted by Wang, et al., (2018, p. 62) were identified namely 4) Cognition Prcess consisting of 4a) IT Artefact, 4b) Organisation and 4c) Affordances Existance, 5) the Recognition Process consisting of 5a) Affordances Perception, 6) Behavior consisting of 6a) Affordances Actualisation and Affordances 7a) Affordances Effects

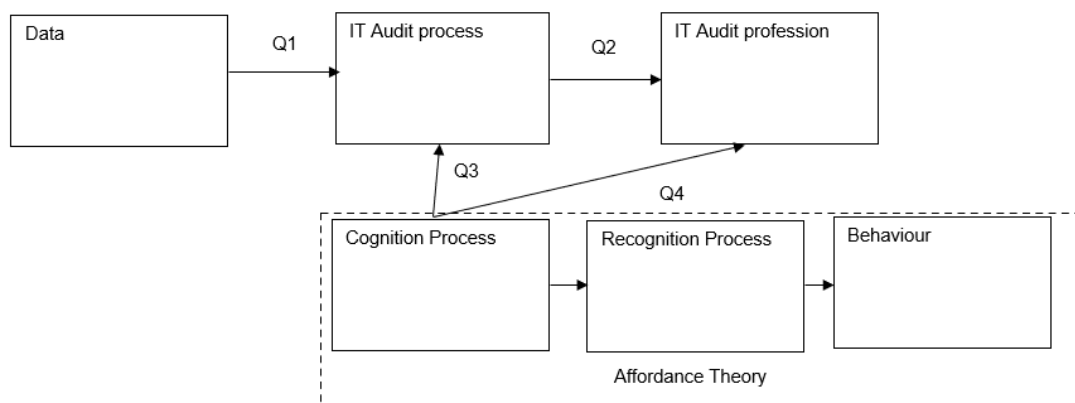


Figure 3: Conceptual framework of the study

Q1: How does data (data access, data analytics/data modelling and big data) affect the application of automation in IT auditing?

DATA

Data Access

In the context of the study, data access refers to Automation of IT audit processes that is enabled by data and this data must be accessible and stored electronically (Huang & Vasarhelyi, 2019; Kogan, Sudit, & Vasarhelyi, 1999; Rikhardsson & Dull, 2016; Vasarhelyi, Alles, Kuenkaikaew, & Littlely, 2012)

Twelve (12) out of the 21 participants highlighted the significance of the availability of quality data, correct data, structured data, accessibility of data, data with high integrity, complete and accurate data, and consistent data.

The participants noted that not only should the data be available, but it should also be of good quality and have integrity:

Participant 1: "The availability of high-quality, structured, and accessible data significantly enhances the automation of IT audit procedures. It enables auditors to leverage tools like machine learning and data analytics to identify patterns, anomalies, and risks faster and more accurately, reducing manual intervention."

Participant 2: "Without data, there is no processing because automation is supposed to process the data and provide us information that we can use, right? So, if the integrity of the data is compromised then so will the results. So, the automation will be pretty much pointless because the automation is also dependent on the input for it to give us the design output."

Participant 3: "If you don't have the proper data for you to perform any automations in an IT audit process, you won't have the output that you need."

Participant 5: "If you don't feed the tools the right data, you will not get the desired result or the right results for the audit. So that's the biggest thing. The integrity of the data that is fed into the tools and then."

In addition to having accessible good quality data, participants noted that the data should be complete and accurate to ensure that the automated outputs yield credible results:

Participant 4: "If It's not complete or accurate... I think it will then skew your audit results in terms of overall conclusions, whether it's effective or ineffective, that might give you, I suppose, like false positives as well as, false negatives... so the reliability and availability of data is important, especially from the timing perspective."

Participant 7: “The more complete and accurate of the data, the more you can rely on the automation of the audit process.

Participant 9: “An important part of what we do and the completeness and accuracy of that data. There's always going to be. A major focus when you when you are using. Even if you're doing it manual or you're using an automation... make sure that you confirm the accuracy on a completeness of the data before you put it through your automated process.”

Furthermore, the participants noted that the data should be fit for purpose to yield any insights. They also noted that the data should be in a structured or usable format:

Participant 6: “It's not just the availability of data, it's the efficient use of data, the insights you can pull from data, the structure that you can pull from there as well”.

Participant 16: “It's often the format that you are able to get the data in. So, if you are using a tool like ACL, normally you would either get a download of the data and you know the format that you get in it in is very important... Is in the right format, is right and then also you know then tying having various control titles and checks to ensure the completeness and accuracy of that data is very important.”

Participant 18: “In order for an automated technology or tool to work effectively right, it needs data in order to work effectively. So in in a sense, without the data, it's very difficult to automate anything, because what would you be automating? You basically have the functionality, but you wouldn't have the underlying substance that these automated.”

Participant 20: “If the data that you're using is incorrect, then by default the automation won't want to yield any benefits.”

Additionally, a participant also noted that consistency of data is required to ensure that the automation works consistently:

Participant 21: “What we're doing is repeatable so that you can automate something that you're going to do over and over again. So, that sort of have that consistency in the in the data to be able to do that. So, it's not just availability of data itself, but actually the consistency of the data as well.”

Data Analysis/Data Modelling

Data Analysis and Data Modelling refer to the Advanced data analytical audit methods, techniques such as data mining and machine learning are used to aid the process of IT audit automation (Rikhardsson & Dull, 2016; Vasarhelyi, Alles, Kuenkaikaew, & Littlely, 2012).

Four (4) out of the 21 participants noted that data analytics and data modelling aid in the automation of audit processes which provides more insights into the data, results in efficiencies, full population testing and trend analysis.

Participants noted that data analysis and data modelling help with predictive insights and ease of automation of repetitive tasks:

Participant 1: “Yes, other enablers include, Advanced analytics tools, Cloud computing platforms.

Blockchain for immutable transaction records, Artificial intelligence (AI) for predictive insights, Robotic Process Automation (RPA) for repetitive tasks.”

Participant 6: “It's the availability of data. And then it's also the insight into the data... So, it's not just the availability, but it's also the fact the intelligence on extracting the right sets of data with the right integrity to make sure you know that you've got... You've got integrity over the data that's coming out to support the automation of the audit procedures that are built on that data. So, I think it's more just the availability. It's also the insight.”

Additionally, participants noted that the use of data analysis and data modelling help with efficiencies as time spent delivering IT audit is shortened. Furthermore, they noted that data analysis and data modelling allow IT auditors to test full populations for their audits instead of sample-based testing:

Participant 3: “Efficiency...You focus on Data Analytics... You get an output of the full population in in a few seconds or minutes.”

Participant 5: “...And shortens the period that is required to audit for example. We are able to use data that is provided by clients in previous years and in the current years. To develop a trend analysis and dashboard for those for those clients.

Big Data

Big data is a significant contributor to the audit automation process where different types of data (structured and unstructured) can be accessed to extract value adding business and IT audit insights (Alles & Gray, 2020; Huang & Vasarhelyi, 2019; Huerta & Jensen, 2017; Pizzi, Venturelli, Variale, & Macario, 2021).

Three (3) out of the 21 participants indicated having one platform (preferably cloud) enables audit automation in a big scale as most of the data will be stored in one place which makes collaboration amongst team members easy. Furthermore, an integration of data sources was noted which allows the access and interaction of multiple data sources:

Participant 5: “The cloud. Definitely a big enabler for automation because it helps, it allows for collaboration by people in different parts of in different geographies. People don't have to be in the same office anymore to be able to collaborate on audits because of the cloud.”

Participant 6: “I'm aware of other automation audit automation enabling. I'm trying to think I know there's tools like GRC tools that are used in some audits where it like for example, you're doing different types of audits where it's ISO audits, third party assurance, SOC audits, financial audits. I know I am aware of tools that are used to Kind of store the data centrally but map it to different types of audits.”

Participant 17: “I think integration right 'cause now with automation like most processes are integrated, right. And there's an interaction of data from multiple sources.”

Participants whose responses were not captured only emphasised the importance of data access and availability, they did not add any additional inputs or insights.

Q2: How does the IT audit process automation affect the IT audit profession in IT auditing?

AUDIT PROCESS

Continuous Auditing (CA) and Continuous Monitoring (CM)

Continuous Auditing (CA) and Continuous Monitoring (CM) as a benefit of audit automation (Chan & Vasarhelyi, 2011; Rikhardsson & Dull, 2016; Vasarhelyi, Alles, Kuenkaikaew, & Littley, 2012).

A participant expressed that tools can be developed to enable real-time auditing which aligns to Continuous Auditing and Continuous Monitoring:

Participant 16: "So, you can develop scripts and tools in data analytics tools such as ACL.

So, that will definitely help you. And I mean, you know, if you're looking at things like continuous auditing, you know is to have direct access to databases, you know preferably obviously read only access. So that you can monitor in real time."

IT Audit Process Automation

Automated audits are an improvement from traditional audits as 1) well defined and repetitive tasks are completed in less time (Frey & Osborne, 2017; Huang & Vasarhelyi, 2019; Huerta & Jensen, 2017; Pizzi, Venturelli, Variale, & Macario, 2021).

Nine (9) out of the 21 participants indicated that any process automation that happens should be governed by the methodology of the organisation. They further stated that the same principles or methods that are applied when auditing manually should be applied to the audit automation for it to be a success.

Participants noted that the IT audit methodology should be embedded on the automation of the IT audits. They noted that similarly to how traditional audits follow the organisation's IT audit methodology, the IT audit process automation should also be guided by methodology:

Participant 1: "The chosen methodology determines how automation is applied. Traditional audit methodologies may need adaptation to leverage automation fully. For instance, risk-based approaches can integrate automated risk analysis, while compliance audits can utilise automated rule-checking systems."

Participant 2: "The automation of the audit procedures has to be a product of the methodology, so the methodology has to be the primary source... It must be in line with the methodology of the entity that you are in, in order for you to actually build this automation for this automation process or bot (audit robot)."

Participant 4: "I think that that methodology, essentially it drives error risk-based approach, right? So, whether it's automated automation of ordered procedures... If it is risk based or if it is control based, you would then it determines your procedures that should apply in order to achieve your objectives."

Participant 8: "I don't know if methodology is a data aspect, but essentially you know guidance on how to do the audit. I think that's important for the automation process because it would guide it would guide the extent of automation needed."

Participant 9: "Everything that you're building. Yeah, all the any automation that you have in your audit procedures, all of it still needs to make sure that it follows our methodology."

Participant 12: "They obtain evidence, and so the way the automation tools are developed, they are developed to specifically target and collect information that is relevant for the audit per the audit methodology. So definitely the audit methodology plays an impact on what data we are collecting from the client."

Participant 19: "If you're automating all the procedures, then it has to be aligned with the relevant methodology. Otherwise, you could end up with an automated solution that actually doesn't answer the question."

Participant 13: "You know the methodology will guide the audit procedures. So, in a point which we are now automating those audit procedures, we're automating them in line with the methodology. So, in automating the audit procedures, it's important that we make sure that we don't lose sight of the actual methodology."

Additionally, a participant noted that the automation should work the same way an IT auditor would, meaning that it should follow the same principles and guidelines that an expert IT auditor would:

Participant 18: "Those same principles that we used to test it manually need to then guide the automation so that automation needs to then use the methodology in order to build those methodology rules. In order to facilitate that methodology, process the same way you would do it as if you were if a human was doing it right. So in in essence the IT process and methodology are there to help guide the building and the development of the rules that the automation would use."

Sixteen (16) of the 21 participants indicated the disadvantages of traditional audits (auditing without automation or having minimal automation). They mentioned that traditional audits are labour-intensive, time consuming, prone to human error, limited scope of analysis, are sample based and require specialised skills which some individuals may not have.

Participants noted that traditional IT audits are labour-intensive and time consuming:

Participant 1: "Traditional methods can be labour-intensive, time-consuming, and prone to human error. They may struggle to handle the large data volumes typical in modern IT systems or detect sophisticated risks without advanced tools... Other difficulties include inefficiency in manual processes, Limited scope for analysing big data. Difficulty maintaining accuracy under time constraints, Lack of real-time insights."

Participant 5: "I wouldn't say I've had difficulties, but it's obviously now in 2024 is not a preferred method of auditing... traditional audit methods take longer, The audits are not always efficient and it doesn't give you enough time to apply your professional scepticism and have enough discussions with the client and interrogate the data that has been provided so that you can also use your judgement."

Participant 14: "It takes long, it's cumbersome and it's repetitive."

Additionally, participants noted that some of the time consumed will be spent on training IT auditors, as without automation, they must know exactly what and how to audit:

Participant 2: "So there will be a lot of time spent in training up resources for them to know exactly what is it that needs to be done. Rather than training resource with automation, all you need to do is to give this (data extractor script) to a client and ask them to run it on the environment and then all you do is analyse... then you need to train the resource on how to analyse the information that they have received. As it stands right now, all we really do is train the resource on how to analyse the information."

Participant 6: "It's the effort. I think there's a much larger effort that's required, much more competent, I suppose in terms of the skills levels. So, you sometimes need very specialised skills. If I take like Linux for example, you probably need someone with a bit more specialist skills to be able to... and it's the volumes of data because you have to be able to go into a Linux."

Participant 18: "The difficulties that I've encountered with traditional auditing is more around the breadth of skills you need in order to do technology audits".

Participant 21: It's the time it's based on the skills of the individual you know whether it's myself or the team. So very dependent on the individuals doing the right things or having the right skills to be

able to do that audit.... and then the time to go and document or assess or reach the results or missing things. Right. So human error kind of stuff.”

Furthermore, a participant noted that there may be a skills gap where training has not taken place which may lead to higher costs:

Participant 4: “I guess it's more that without automation, maybe just the skills gap. That one. And then I guess the time and the effort that's involved, so it's the. So, with automation specifically you achieve a higher controls assessment with a lower budget and lower effort whereas on a traditional auditing it would be lower controls achieved with a higher budget and higher effort.”

Additionally, participants noted that traditional audits rely on sample-based testing instead of full population testing. Furthermore, the labour-intensive nature of traditional IT audits makes them prone to human error:

Participant 3: “So in traditional audits we would actually have no tools implemented, we'll have to sample less, let's say, like we do come across where populations are over 1000, you know, but we are sampling only 35, and we're not having a full overview of what's happening with the rest of our sample, if maybe it's users or changes, you don't have a full view”

Participant 11: “I guess to be honest, in terms of the completeness idea and accuracy, because I believe the human error always exist.”

Participant 16: “You kind of auditing on a sample basis. So, I suppose it is still a risk that you might be missing something where you're not getting greater coverage which some of these some of this automation would assist you with.”

Participant 17: “In traditional audit methods, we're relying on a lot of manual processes, so there can be a lot of human error, like when I'm selecting a sample, I might be select selecting an incorrect sample. Or from an incorrect source”

Additionally, participants also mentioned that traditional audits made the data collection (audit evidence collection) difficult as evidence had to be collected in person, using a certain hard drive, which could cause storage issues and security issues. They also mentioned that getting large volumes of data also took longer and resulted in audit inefficiencies:

Participant 7: “You literally had to go and get the evidence in person, so there were always limitations in terms of you being available. The system needs to be available. The administrator needs to be also available at the same time. But yeah, it's it. It was. It was time consuming...A bit tedious if

you think about it. Having to drive all the way, for example too far to be able to get evidence of admin status access as an example, instead of just requesting that online and then just saving it onto the organisation's cloud platform is an example.

Participant 9: "I guess the only difficult part was making sure that you're storing that evidence. So, if it's a printout, making sure that you you're copying it and keeping it in your actual file as evidence."

Participant 13: "I think dealing with large volumes of data. It's kind of hard. It becomes difficult to extrapolate all of that data and keep the information that you need."

Participant 15: "the storage of that was an issue and obtaining the data was an issue. We had to physically go to the client, and they had to transfer it on physical drives."

Q3: What is the effect of affordances as a result of audit automation on the IT audit process in IT auditing?

AFFORDANCE THEORY

In the Information Systems research context, the affordance theory has been contextualised to understand the relationship between the technology and the human actor (Mkhomazi & Iyamu, 2013) in this research report the relationship between the IT auditor (organisational perspective) and the IT audit automation (IT artefact).

COGNITION PROCESS

IT Artefact

The IT artefact based on the context of the study (Wang, Wang, & Tang, 2018). In this study the IT artefact is the varying audit automation tools used by IT auditors.

Eight (8) out of the 21 participants noted that there should be skilled personnel who should configure the automation platform, there should also be support services to support the automation tools when they do not work as they should, the automation, platform or tool should be compatible with the procedures that the organisation wants to adopt it for, the tools should be vetted before they are used, and a proper change management process should be followed.

Participants noted that the IT audit automation tools should be programmed or configured by skilled and IT audit proficient personnel who can also provide IT support to the IT auditors when needed:

Participant 2: "...There's also someone, an individual that needs to configure it."

Participant 7: "I think we need technical people to be able to configure. I mean, if you look at some of the tools that we make use of...We have support people that are in the back end who are able to because not all client systems are the same or configure the same. So, in terms of you being able to get the data and fit it into the tool, it may need you know a range of skills in the back end."

Participant 12: "People that have the knowledge and skill to develop or create these (automation tools)."

Additionally, participants noted that the IT audit automation tools should be tested before they are implemented to ensure that they are performing the tasks they are meant to perform:

Participant 7: "The tools need to be assessed for integrity in terms of running checks to see if we input certain information, the processing, and the output. The output meets our expectation so you can't necessarily just take a tool and trust that it's doing what it's expected to be doing without having a test case as an example. So yeah, it's us validating that the tool is processing data."

Participant 14: "We have to do a 2850(tool evaluation) on any specific audit automation tools to make sure that it has been configured correctly and that we have tested it and that we have sign off on it etcetera so it's I'll say that it's part of the methodology, but if it is a tool, we obviously need to make sure that it's fit for purpose and it does what it's supposed to be doing."

In addition to testing the logic of the IT audit automation tools participants noted that there should be test that ensure that the tools are free from bias or any additional coding errors:

Participant 16: "If you are using even things like RPA and Gen AI, you know generative AI, you still need someone to test that RPA and that Gen AI and assess that the information is, you know actually accurate and correct and logically make sense. And it's free from bias."

Participant 17: "Another risk. Coding, for example, they might be coding errors. Yeah, when we develop like our tools for example."

Participant 18: "Which is any tool that's developed that we wanna use in an audit needs to be vetted in a certain way to ensure the reliability of the tool before we actually use it on an audit."

Furthermore, a participant noted that there should be a technology platform that supports the IT audit automation:

Participant 18: "I guess from a technical perspective; in order to technically automate something, you need to have the right. Technology platform. So, whether it's, you know, a specific type of infrastructure that we need or whether it's a hardware or software or one of those type of things, architecture, cloud, et cetera, right. So, you might need something in order to enable the tech that you need. So, the, the, the tech, the techs out of it is also quite key. And then I guess the other part of it is then to make sure that people themselves that need to now deploy these tools."

Affordances exitance

The cognitive process of where the human actor perceives potential affordances when interacting with IT artefacts (objects) (Wang, Wang, & Tang, 2018).

Four (4) out of the 21 participants perceived potential affordances from the audit automation. They perceived it to provide efficiency, reliability, cost cutting, greater assurance in audits and overall good quality audits:

Participant 2: "I mean automation is extremely important for us to be more efficient in what it is that we do. But we still need to upskill our resources and have an even element to it."

Participant 4: "I think it's important. I think it's it comes back to I guess budgets, reliable results, but I think there's a certain degree that you can rely on audit automation."

Participant 5: "When you use automated IT procedures, you are using data. You are sampling 100% of your samples. It's more efficient. You can audit quicker. You can spend more time on things that require. Your professional judgement. Yeah. You focus more on the quality of the data that you've been given rather than the quantity. And you are able to have better engagements with clients."

Participant 18: "I think the efficiency gain is the one, so it's definitely faster, more efficient, requires less time. I think that from a people perspective, it also speeds up the way that we do audits, and it simplifies the task of the IT auditor that's conducting the review, right, so that that person doesn't need to have all of the skill sets that the tool has. The tool could have most automation built into it then what the human might have and so the biggest advantage is that you don't need somebody that's got all of the skill sets. You need. Somebody that can successfully use the tool, and so if you have the ability to train people on the automation, the automation can then do some of the heavy lifting as part of the audit course to make it more efficient."

Organisation

Ten (10) of the 21 participants indicated that the organisational culture embraces the use of IT audit automation:

Participant 1: Organisations often view audit automation positively as it boosts efficiency, enhances accuracy, and allows a focus on strategic issues rather than routine tasks.

Participant 3: "I know obviously there is like the emerging technology team, they focus on identifying like AI opportunities in clients. So, it's slowly trying to bring in AI in audit which would actually assist us in lessening the manual part and every time maybe we are going to the different clients."

Participant 4: "That's a big driver, I guess or that's a big driver or focus area within our organisation in terms of audit automation. So, I think it's one of our focus areas because it enhances the efficiency of the audit. It ensures that we remain up to date as well... We're early adopters. I think it's early adopters. So, in terms of organisation, it's early adoption. So, I think as and when new technologies identified or new automation potentials are identified to them as an early adoption behaviour from specifically in our organisation, I think."

Participant 5: "My organisation is at the forefront of using audit automation. We are one of the leading organisations that have adopted and embraced automation in all its forms with all that it comes with, we have cutting edge, leading audit automation methodologies."

Participant 7: “So I think in terms of perception that my organisation is definitely pro it, they do want audit automation. They're driving that, that the driving, the use of it and they're trying to create tools, and we have a whole team dedicated to looking at how to improve this. So, I think definitely good perception of it in terms of behaviour.”

Participant 9: “I guess from our organisation we embraced it; we've implemented automation in our processes to enable our auditors to be more efficient and like I mentioned too to be able to use their time more sparingly in the end, analyse the evidence. Instead of them taking. I guess longer to get all the information that they need.”

Participant 12: “The organisation is open and has implemented various tools to automate the audit process.”

Participant 18: “I think that there's a big focus on automation. So, I think our organisation is very pro in terms of using audit automation. I think we've seen benefits of it. If we look at some of the automation tools that we have existing, and I think there's a good appetite.”

Participant 20: “we have adopted automation, and we keep on pushing to automate our processes. So, adoption level is very high.”

Participant 21: “The organisation embraces it, and we've got some nice tools, whether it's in, in our IT space or more. More generally, across audit as a whole and I think quite a lot of investment goes into this locally and globally in the firm as a whole.”

Two (2) out of the 21 participants mentioned that there may be some resistance in the organisation due to the fear of job losses.

Participant 1: “there may be resistance due to concerns about costs or displacement of job”.

Participant 18: I think there's a maybe there's a risk of job losses or job displacement in the longer term, even though it's not necessarily now. But it might also mean that we need to evolve those skills into something different. So maybe the role of the human IT auditor becomes a bit different from what a human ideal auditor does at the moment, so that you can leverage the tool, but your role maybe is to go and look at the exceptions and help evaluate the exceptions with management as opposed to worrying about how the tool goes and analyses.

Five (5) out of the 21 participants also mentioned that they receive periodic training on the use of audit automation tools:

Participant 1: “Yes, training is critical to effectively use these tools. Training typically includes data analytics, system navigation, and interpreting automated outputs. Organisations must invest in regular upskilling for auditors.”

Participant 2: “We have continuous training that at our organisation.”

Participant 5: “Yes, it's part of our training and learning programme. We are trained to use audit automation tools every time when they're implemented in our environment. So, I would say probably on an annual basis, there's at least three training programmes where we are taught to use the audits tools.”

Participant 7: “Of course, we are always being trained.”

Participant 9: “I guess our team as part of our onboarding processes. We train our teams on how to use some of the automation.”

RECOGNITION PROCESS

Affordances Perception

The recognition of the existence of affordances per the perception of the potential affordances (Wang, Wang, & Tang, 2018).

Nine (9) out of the 21 participants indicated a positive perception of the audit automation tools due to the efficiency it provides, the limited level of labour required to conduct audits and the resulting cost saving.

Participants noted that IT audit automation afforded them efficiencies and limited manual labour:

Participant 1: “Perceptions are generally positive, as these tools streamline processes and improve results.”

Participant 3: “It is good, you know, because I'm saying it's good because I I'm just a person who likes learning different things and sticking to one thing.”

Participant 4: “It's the level of effort required to achieve. I guess the results, so it's minimal effort, enhanced well improved budgets because you're doing same amount of work, it's just quicker.”

Participant 5: "I think it's great. I think. I think we need more of it. I think there needs to be more education, especially for audit. Companies that are not part of a global network. I think people need to make use of what is available already out there and the likes of chat GPT whatever engines available to build their own audit automation tools."

Participant 6: "from the organisational perspective that audit automation is probably the future. But I think there is a journey also that needs to happen to get to the what the future state will look like."

Furthermore, they noted that IT audits afforded them improved IT audit costs:

Participant 2: "the quicker you are able to do something the more you are able to make more (profit), that's the business that we are in. So, the biggest aspect of it is that in order for us to sell more time, there are certain things that need to be more automated."

Participant 4: "It's the level of effort required to achieve. I guess the results, so it's minimal effort, enhanced well improved budgets because you're doing same amount of work, it's just quicker."

Participant 15: "Is the monetary value that does come at the time, you know, being able to show that a piece of work that would generally take a person 12 hours to complete can be done within two minutes one moment."

Participant 20: "Good cost cutting well, although tools are expensive at the beginning, but in the long run, in the long run, the efficiency will result in profitability."

Participant 21: "I think there's potential for benefits around. Costs or improved margins for auditors"

BEHAVIOR

Affordances Actualisation

The interaction with IT artefact by human actors to realise affordances (Wang, Wang, & Tang, 2018).

Five (5) out of the 21 participants indicated using the IT audit automation tools to realise the different benefits they offer:

Participant 2: "We believe so much in automation that there's an entire team dedicated to automating everything, trying to organise this. So, like we're always looking for ways to do things in a more efficient."

Participant 5: "Audit automation is embedded in everything that we do. All our audits use automation in some form of shape."

Participant 12: "Saving hours from manual compilation. You know of reports and from manual extraction of data."

Participant 16: "It's definitely a lot more efficient and effective... You get great coverage, you know, because you are able to perform tasks you know and often perform it to where we're testing 100%. You know, you get a greater assurance from it."

Participant 19: "I guess also maturing mundane tasks frees us up to focus on the things that potentially matter more to our clients."

Affordances effects

Effects achieved as a result of the actualisation of affordances by human actors (Wang, Wang, & Tang, 2018).

Eight (8) out of the 21 participants noted the effects of using audit automation tools such as competitive advantage, reduced costs and, saving time, resulting in efficient audits where full populations are tested and have limited human error.

Participant 1: Reduced time and costs, Improved accuracy and reliability, Ability to analyse large datasets efficiently, Enhanced compliance monitoring, Continuous auditing capabilities.

Participant 2: "the biggest thing is time... The results are more accurate, there is less room for human error, there's less room for human manipulation, there's less room for human omission, and you also are more efficient in it."

Participant 5: "It enables us to audit quicker and we're able to order 100% of samples, unlike using traditional ordered methods which only limit you to a sample basis in a lot of instances."

Participant 8: "You know, the fact that we run the script it like it's a very quick process to run it and get all the information and then you analyse. So, I think it's a, it's definitely a time saver if it works correctly and you can get all the information you need."

Participant 12: "Encouraging the automation of the audit process to save time. And because you know, time is money in our space."

Participant 13: “The marginal room for error decreases. Because now you're processing everything through a tool. I think you're able to streamline a lot of monotonic tasks. You know, very mundane type of tasks. You are kind of able to streamline that into maybe even just one task. You're able to kind of even just do certain point of efficiency, able to cut down times on of analysis. I think it makes the audits more concise. It makes the audits more efficient.”

Participant 16: “Automated IT audit procedures. It's kind of just puts you in the forefront of your competitors.”

Participant 21: “I guess the benefit; the most direct benefit is the consistency.”

The common themes amongst participants on the affordances effects of IT audit automation were, reduced time to perform audits, cost saving and limited human error. Although this was not captured for all participants, the themes were implied on the responses not included under this concept.

Ten (10) out of the 21 participants also mentioned negative effects of using audit automation tools such as high initial costs, losing professional scepticism and judgement due to overreliance, getting approval/buy-in from stakeholders, incompatibility issues and lack of adoption in certain cases.

A participant noted that costs to implement audit automation tools may be expensive at initiation and buy-in from clients and the IT auditors is also required to yield positive results on the technology investment:

Participant 1: “Initial implementation costs, Dependence on accurate data. Potential for system errors or misinterpretation of results. Reduced emphasis on critical thinking if over-reliant on automation.”

Participant 5: Sometimes getting buy in from clients to allow you to use the tools. And then the tools can also throw out a lot of exceptions. In instances which may in turn require us to spend more time analysing those exceptions... people can become lazy and just take what the tool has thrown out and put it into reports.”

Additionally, participants noted that there may be overreliance on the IT audit automation tools where some IT auditors may not apply their professional judgement and professional scepticism:

Participant 2: “Losing, the professional scepticism and also professional judgement in the sense that no one environment is the same... over, reliance would be a disadvantage.”

Participant 4: “over reliance on the automation, so over reliance results and like a skills gap I suppose because you've been become very dependent on the audit automation, so you actually don't know how to do it without tools?”

Participant 6: “sometimes it allows for us to be lazy on getting more technical knowledge. So, while we may get the insight more so because we get insights more easily, we would then not, you know, be incentivised to get detailed technical knowledge.”

Participant 7: “so the behaviour there is people are not adopting it because they don't manual procedures easier.”

Participant 8: “There'll be too much reliance on it. I think people will think because it's automated and it's always gonna work. They're going to stop thinking as much. Stop applying scepticism. Stop asking like the rare questions or the, you know, nuanced questions. They're going to think that the automated process is running at all and we're not going to audit as deeply as we do now.

Participant 13: “I think it can make people lazy. You know, I think maybe from we might take off our analytical brains a bit and you know kind of just take whatever we get from visual aid perspective, and you know cut and paste.”

Participant 16: “I suppose it's kind of over reliance on technology, so you know where people aren't aware of the risks and they just rely, you know, blindly on the output.”

Furthermore, a participant also noted that there may be some integration issues in cases where the IT audit automation tools are not compatible with the audit firm's existing audit tools:

Participant 17: “They might be integration challenges, right in terms of different systems.

Right. And then data security? Yeah. So now 'cause, we're handling sensitive client data. So, it might be there like there's a high risk of. Data being manipulated and all that and then.

Overall, the participants noted positive affordances from the use of audit automation tools. Although negative effects were noted, most of the participants believe that the positive effects/affordances of using audit automation tools outweighs having to use traditional IT auditing methods.

Q4: What is the effect of affordances as a result of audit automation on the IT audit profession in IT auditing?

IT AUDIT PROFESSION

IT Audit Profession Automation

The automation of the IT audit profession (Eulerich, Masli, Pickered, & Wood, 2023; Pizzi, Venturelli, Variale, & Macario, 2021; Rikhardsson & Dull, 2016; Zhang, Thomas, & Vasarhelyi, 2022).

Ten (10) out of the 21 participants noted that the IT audit profession cannot be fully automated as some elements such as professional judgement and scepticisms cannot be automated yet:

Participant 1: “No, while many processes can be automated, human judgment remains essential. Tasks like evaluating the context of findings, exercising professional scepticism, and making strategic decisions require human expertise... You can't teach a robot to be professional.”

Participant 3: But it I don't believe it would be 100% (automated), there are people who are still headstrong in continuing and doing testing in the normal way, meaning like traditional way.

Participant 4: “I think to a certain degree, but not fully because there's still an element of, I guess, judgement that would be applied.”

Participant 5: I don't think that the IT profession will be fully automated. I think that auditing by its nature requires professional scepticism and judgement. Which tools will not be able to do without the intervention of human beings. Even the data that is fed into those tools come from humans, so there will be a lot of automation in future, but I don't think it will fully replace people.

Participant 7: “I feel like yes, we can automate 80% of the work that it ordered us do, but there's still the last 20% where you need to evaluate the data, the outcomes you know and make a call in terms of whether the risk is at best or not and sometimes also tools may not be able to capture the compensatory controls which are sitting outside of the normal processes.”

Participant 8: “I don't think it can be fully automated. I think there is some level of scepticism that you need to conclude on an audit, and I don't think an automated process can fully do that. It can maybe get you too close to even like 80% of it, but I'll always think that you need an auditor to come in, look at the results and say, okay, I'm comfortable with what's been done or I'm not, we didn't consider this... I don't think it's something that is going to replace the career or the profession as a whole. I think it's going to be a combination of both, where it might reduce the effort.”

Participant 9: “so until our clients processes are fully automated, I don't we can fully get to a point where we are fully automated auditors.”

Participant 11: "In my opinion, I don't think so as much as the automation tools or other automation audit procedures actually as it starts in lot of data and time consuming all that, but there's still a level of decision making from us as a profession."

Participant 21: "I don't think we're. I don't think we're anywhere close to the point of not requiring skilled professional individuals."

Overall, the participants believed that the IT audit profession cannot be fully automated, more tasks will be automated, and the role of the IT auditor would be mostly entail verifying results produced by IT audit automation tools and by applying their professional judgement. However, one of the participants noted that the automation can happen fully however, they would not support it due to the negative results:

Participant 2: "I'm saying it's something that can happen. I don't think there's anything stopping the audit process from being fully automated, but I don't think I wouldn't. I wouldn't support it. It's not something that I would support in the organisation."

Another participant agreed that the IT audit profession can be fully automated with the use Artificial Intelligence (AI) which can perform some "human" traits as it is teachable.

Participant 14: "What's happening now is it's AI superseding it and the need for a rule-based engine is going to go out of the window because the models train and teach itself. So, machine learning is quite important. So, we can run it over our processes."

Two (2) out of the 21 participants noted that even though AI tools are teachable, some have been proven to hallucinate and provide impossible solutions. Furthermore, there have been confidentiality and data security issues:

Participant 19: "I am a little bit sceptic. My views on this are influenced by some of the rather. Alarming instances of AI tools, just hallucinating and all that kind of things. So, I don't know if I want to some a solution that is prone or that is known to hallucinate even if even if it hallucinates, you know, not very frequently. But if there's a chance of something hallucinating, do I want it to make the decisions around the, you know, like a statutory report that that influences shareholding activity."

Participant 20: "The biggest component that has been preventing us from adopting a lot of the stuff is. Some complaints, right. And I'm gonna give an example with your generative AI. Now it's a question of confidentiality of information. We don't want to lose such information. Of our clients and so forth. It has, really prevented us from adopting the use of this technology at the rate that we should be."

Role of Auditor

The role of the IT auditor given the automation of the IT audit profession (Huerta & Jensen, 2017; Kogan, Sudit, & Vasarhelyi, 1999).

Eleven (11) out of the 21 participants believe that IT audit professionals will work together with humans. The audit tools will conduct the automated functions of audits and professionals will verify the information from the tools to ensure that the audit automation tools are working as they should.

Participant 1: "Tasks like evaluating the context of findings, exercising professional scepticism, and making strategic decisions require human expertise."

Participant 2: "You still need to understand that you still need someone else to analyse and that you cannot fully automate. And no environment runs exactly the same as the other. There are too many things. There are too many variations."

Participant 4: "You'd still need your judgement to be applied..., there's an element of professional scepticism and judgement that needs to be applied so I don't think you can just take it as is. I think you need to apply those (professional judgement and scepticism) to your results overall and it's always important to understand it all. Maybe understand the procedures that are being performed. To ensure that your objectives are still achieved, even if it's via audit automation?"

Participant 5: You can spend more time on things that require. Your professional judgement. Yeah. You focus more on the quality of the data that you've been given rather than the quantity. And you are able to have better engagements with clients."

Participant 6: "You still need to have human elements to it, right? So, it (automation) can do the volume, but you still need to have a human to make some of the higher judgement calls."

Participant 8: "You need an auditor to come in. Look at the results and say, OK, I'm comfortable with what's been done or I'm not what we didn't consider this."

Participant 9: "You still need to have Professional scepticism. You still need to have professional judgement."

Participant 12: "I still feel that verification by experienced auditors will always be needed, even if it comes in right at the end, just to look through the file to verify. You know if the automation. Was working as expected."

Participant 13: “Human scepticism and professional judgement, which is definitely one of factors that we look at as part of our methodology.”

Participant 15: “I do foresee that we we're going to have a scenario where people evolve into different roles.”

Participant 16: “No, I don't think so. You know, I mean, although it can be used to supplement and improve and be more efficient and more effective. If you are using even things like RPA and Gen AI, you know generative AI, you still need someone to test that RPA and that Gen AI and assess that the information is, you know actually accurate and correct and logically make sense. And it's free from bias. So no, I don't think I the IT Audit Profession can be replaced.”

Four (4) out the 21 participants believe that there will be a period where the IT audit profession has been fully automated with no human intervention. They mentioned that this will not happen soon:

Participant 14: “Eventually, I think AI will be used to potentially audit companies in real time, more in real time. So, any deviations from standard process etcetera will get flagged. I do think that eventually will API and into our client's systems and we will pick up all the anomalies instantaneously and get them to explain and the dashboard etcetera. And I can see a future for it. But it's not five years away. It's probably 20 years away.”

Participant 15: “I mean AI coming now the idea is that we also want to eventually automate everything.”

Participant 18: “The entire profession? Well, when I say can't be or what, I don't think it will be. I don't think like in the medium term it will be or short, short medium term that it will be because I don't think the tools or the automation has reached that point yet, which has advanced that it can right. But if I had to look longer term and say do you think you could get an IT auditor that would be automated entirely, I think that's possible.”

Participant 20: “I think we're headed there (full automation).”

Five (5) out of the 21 participants also mentioned that the role of IT audit professionals will evolve, and those who do not evolve with it will lose their jobs. IT auditors must continue skilling themselves and adapt as the changes happen:

Participant 3: “Some people end up losing jobs because they don't want to change with the times, you know, so that's the disadvantage of it.”

Participant 5: “The IT profession needs to adjust also to allow for people who are programmers to be part of the team so that they can help us enhance what we already have, even help automate the audit operational side of things in a valuable way.”

Participant 6: “People are generally resistant to change.... there is definitely a push to get everyone out of the comfort zones, to be able to embrace the changes that come with audit automation. So, I think that's being managed. But in terms of, you know, getting the behaviour right with the, with the, with the people at the organisation to embrace change. But I think inherently people are just by default resistant to change.”

Participant 11: “I think as humans or as people always a professional sometimes. We shy away from experiencing something new tools... So, the adoption is people are not really adopting it (automation) because they are used to one way of auditing... Automation's definitely the future. If we don't automate, we'll remain behind.”

Participant 19: “It's a change management type thing of you know, of ensuring sufficient adoption of certain tools. So, we've got these really awesome tools. But if you look at the adoption if you look at audit files you know you cannot find audit files where those tools are actually being deployed consistently.

Overall, the participants noted that the IT audit profession will not be fully automated, there will be automated elements of the profession that still require the IT auditors' intervention. IT auditors will work together with the IT audit automation tools and be verifiers of information. However, a few of the participants noted that the profession can be fully automated with the use of AI which is teachable and can perform “human” tasks, however, they are not in support of the automation as AI tools can hallucinate. Furthermore, participants noted that the profession will evolve and those who do not adapt by upskilling will lose their jobs.

5 CHAPTER FIVE – DISCUSSION OF THE FINDINGS

5.1 INTRODUCTION

This chapter outlines the presentation of the findings and links it back to the literature review performed for this study.

Q1: How does data (data access, data analytics/data modelling and big data) affect the application of automation in IT auditing?

In the literature review section of the study, data was noted to be a key enabler of IT audit automation. Access to appropriate data sets that are stored electronically are required for audit process automation (Huang & Vasarhelyi, 2019; Kogan, Sudit, & Vasarhelyi, 1999; Rikhardsson & Dull, 2016; Vasarhelyi, Alles, Kuenkaikaew, & Littley, 2012). Audit automation is considered matured when there are advances in the data quality and there is complete data access in an audit data warehouse (Rikhardsson & Dull, 2016; Vasarhelyi, Alles, Kuenkaikaew, & Littley, 2012). This was also supported by the interviews as most participants highlighted the significance of the availability of quality data, correct data, structured data, accessibility of data, data with high integrity, complete and accurate data, and consistent data.

Data modelling and data analytics have long been utilised on traditional audits where statistical techniques were used for analytical procedures (Chan & Vasarhelyi, 2011; Dzurainin & Malaescu, 2016; Titera, 2013). However, in automated audits, data modelling and data analytics techniques are utilised in the form of data mining and machine learning techniques for testing predictive controls in the proactive audit approach (Chan & Vasarhelyi, 2011; Pizzi, Venturelli, Variale, & Macario, 2021). It was noted that an increase in the data quality and integrity used for audit automation, resulted in more the confidence placed on the data for decision making and reporting in audits which added to the quality and efficiency of reporting (Rikhardsson & Dull, 2016; Vasarhelyi, Alles, Kuenkaikaew, & Littley, 2012). The interview also supported this as some participants noted that data analytics and data modelling aid in the automation of audit processes are key as they provide more insights into the data, result in efficiencies, full population testing and trend analysis.

Big data has been identified as one of the drivers of audit process automation (Alles & Gray, 2020; Caster, Elder, & Janvrin, 2021; Frey & Osborne, 2017; Huerta & Jensen, 2017; Pizzi, Venturelli, Variale, & Macario, 2021). Some of the participants indicated having one platform (preferably cloud) enables audit automation in a big scale as most of the data will be stored in one place which makes collaboration amongst team members easy. Furthermore, an integration of data sources was mentioned which allows the access and interaction of multiple data sources.

Based on the above it can be noted that data is a significant contributing factor on the automation of audit processes.

Q2: How does the IT audit process automation affect the IT audit profession in IT auditing?

Continuous auditing and continuous monitoring have evolved the way in which traditional audits are performed basis (Chan & Vasarhelyi, 2011; Kogan, Sudit, & Vasarhelyi, 1999; Pizzi, Venturelli, Variale, & Macario, 2021; Rikhardsson & Dull, 2016; Vasarhelyi, Alles, Kuenkaikaew, & Littley, 2012). A participant expressed that tools can be developed to enable real-time auditing which aligns to Continuous Auditing and Continuous Monitoring.

Traditional audits are performed on a periodic basis, e.g., yearly; the audit approach is reactive where issues are picked up after they have materialised; the audit procedures used are manual in nature; the role of auditors entails manual labour where samples are selected from the full population to conduct testing; the results of the tests done by auditors are also reported periodically when the audit happens (Chan & Vasarhelyi, 2011; Vasarhelyi, Alles, Kuenkaikaew, & Littley, 2012). Participants indicated the disadvantages of traditional audits. They mentioned that traditional audits are labour-intensive, time consuming, prone to human error, limited scope of analysis, are sample based and require specialised skills which some individuals may not have. Furthermore, some participants also mentioned that traditional audits made the data collection (audit evidence collection) difficult as evidence had to be collected in person, using a certain hard drive, which could cause storage issues and security issues. They also mentioned that getting large volumes of data also took longer and resulted in audit inefficiencies. These perceptions were found to be consistent with the literature reviewed for this study.

In contrast to traditional audits, continuous/automated audits happen on a frequent basis, e.g., monthly, weekly, daily, or real time depending on the needs of the organisation; the audit approach is proactive where potential issues are picked up before they materialise; audit procedures are automated; data analytics and data modelling are used for testing where full populations are mostly used for testing; the results of the testing are reported on a frequent basis as per the organisation's needs (Chan & Vasarhelyi, 2011; Vasarhelyi, Alles, Kuenkaikaew, & Littley, 2012). Participants indicated that any process automation that happens should be governed by the methodology of the organisation. They further stated that the same principles or methods that are applied when auditing manually should be applied to the audit automation for it to be a success which will the result in yielding the perceived benefits. This is consistent with the literature reviewed for this research report which means that audit firms also must consider if certain audit automation tools are aligned with their IT audit methodology before they can adopt them, as they may not fully reap the benefits of the audit automation tools if there is a misalignment with their IT audit methodology.

Q3: What is the effect of affordances as a result of audit automation on the IT audit process in IT auditing?

In the Information Systems research context, the affordance theory has been contextualised to understand the relationship between the technology and the human actor (Mkhomazi & Iyamu, 2013) in this research report the relationship between the IT auditor (organisational perspective) and the IT audit automation (IT artefact).

The IT artefact based on the context of the study (Wang, Wang, & Tang, 2018). In this study the IT artefact are the varying audit automation tools used by IT auditors. Participants noted that there should

be skilled personnel who should configure the automation platform, there should also be support services to support the automation tools when they do not work as they should, the automation, platform or tool should be compatible with the procedures that the organisation wants to adopt it for, the tools should be vetted before they are used, and a proper change management process should be followed.

Affordances existence is the cognitive process where the human actor perceives potential affordances when interacting with IT artefacts (objects) (Wang, Wang, & Tang, 2018). Participants perceived potential affordances from the audit automation. They perceived it to provide efficiency, reliability, cost cutting, greater assurance in audits and overall good quality audits. These are in line with the benefits of using audit automations tools outlined in the literature review.

The organisation based on the context of the study (Wang, Wang, & Tang, 2018). Most participants indicated that the organisational culture embraces the use of audit automation as there are affordances existence as discussed in the previous paragraph.

The recognition of the existence of affordances per the perception of the potential affordances (Wang, Wang, & Tang, 2018). Participants indicated a positive perception of the audit automation tools due to the efficiency it provides, the limited level of labour required to conduct audits and the resulting cost saving. These are in line with the benefits of using audit automations tools outlined in the literature. Some of the participants mentioned that there may be some resistance in the organisation due to the fear of job losses, in the literature (Frey & Osborne, 2017) noted that there is a 94 percent probability of the audit profession being replaced by automation. Furthermore, participants mentioned that they receive period training on the use of audit automation tools which influenced the positive organisational culture on the use of audit automation tools.

Affordances Perception is the recognition of the existence of affordances per the perception of the potential affordances (Wang, Wang, & Tang, 2018). Participants indicated a positive perception of the audit automation tools due to the efficiency it provides, the limited level of labour required to conduct audits and the resulting cost saving which is in line with the benefits of automated audits outlined in the literature review of this study.

Affordances Actualisation is the interaction with IT artefact by human actors to realise affordances (Wang, Wang, & Tang, 2018). Participants indicated that they use the audit automation tools to realise the different benefits they offer which are in line with the benefits of automated audits outlined in the literature review of this study.

Affordances effects are effects achieved as a result of the actualisation of affordances by human actors (Wang, Wang, & Tang, 2018). Participants indicated the effects of using audit automation tools such as reduced costs, saving time, resulting in efficient audits where full populations are tested and have limited human error which are in line with the benefits of automated audits outlined in the literature review of this study. Additionally, participants also mentioned negative effects of using audit automation tools such as high initial costs, losing professional scepticism and judgement due to

overreliance, getting approval/buy-in from stakeholders, incompatibility issues and lack of adoption in certain cases, however, the perceived benefits exceeded the cost of not using the audit automation tools which were also outlined on the literature review chapter of this research report.

Q4: What is the effect of affordances as a result of audit automation on the IT audit profession in IT auditing?

The automation of the IT audit profession (Eulerich, Masli, Pickered, & Wood, 2023; Pizzi, Venturelli, Variale, & Macario, 2021; Rikhardsson & Dull, 2016; Zhang, Thomas, & Vasarhelyi, 2022). Most of participants noted that the IT audit profession cannot be fully automated as some elements such as professional judgement and scepticisms cannot be automated yet be automated. This is in line with the reviewed literature automation of tasks requires that they should be well-defined and repetitive (Frey & Osborne, 2017; Huang & Vasarhelyi, 2019), they should also be easily programmable (Frey & Osborne, 2017).

However, some of the participants believe that there will be a period where the IT audit profession has been fully automated with no human intervention. They mentioned that this will not happen soon which is in line with (Frey & Osborne, 2017) who noted that there is a 94 percent probability of the audit profession being replaced by automation.

One (1) participant noted Artificial Intelligence (AI) can perform some “human” traits as it is teachable which contradicts the literature review performed in this study that details that only certain tasks can be automated (Frey & Osborne, 2017; Huang & Vasarhelyi, 2019), they should also be easily programmable (Frey & Osborne, 2017). However, some of the participants noted that even though AI tools are teachable, some have been proven to hallucinate and provide impossible solutions. Furthermore, there have been confidentiality and data security issues.

Role of Auditor is the role of the IT auditor given the automation of the IT audit profession (Kogan, Sudit, & Vasarhelyi, 1999; Huerta & Jensen, 2017). Most participants believe that IT audit professionals will work together with humans. The audit tools with conduct the automated functions of audits and professionals will verify the information from the tools to ensure that the audit automation tools are working as they should. This is in line with the literature review of the study where audit tasks such as being innovative or creative to make daily audit tasks better cannot be automated, furthermore, the auditing of unstructured data cannot be automated, also, social intelligent tasks such as negotiation and persuasion (used during negotiations when findings of audits are presented to process owners) cannot be automated. Auditors can work together with audit automation tools to ensure efficiency in the audit process (Kogan, Sudit, & Vasarhelyi, 1999; Huerta & Jensen, 2017). Automation can be used for repetitive tasks that do not require human judgement and for pattern recognition in proactive auditing (Huang & Vasarhelyi, 2019). Furthermore, auditors can focus on tasks that require professional judgement (Huang & Vasarhelyi, 2019; Zhang, Thomas, & Vasarhelyi, 2022), additionally, they can upskill themselves to obtain data analytical skills (Huerta & Jensen, 2017) where they play the role of an information worker/data certifier who analyses results from audit automation tools and give audit assurance to the organisation. Some of the participants also mentioned that the role of IT audit professionals will evolve, and those who do not evolve with

it will lose their jobs. IT auditors must continue skilling themselves and adapt as the changes happen. This was also supported by the literature review conducted for this study.

Main research question: What impact does the automation of IT audit processes have on IT auditors/IT audit profession?

Positive impacts

Based on the 21 interviews conducted with the IT auditors it was noted that automated audits result in increased efficiency and accuracy in IT audits. This means that audits are performed timely, and audit results are accurate as there is limited intervention which leaves a minimal margin for human error. Additionally, it was noted that full populations are tested instead of sample-based testing. Automated audits also enable continuous auditing and continuous monitoring where audits happen more frequently. These audits are proactive in nature where issues are picked up before they materialise which ensures improved fraud detection and compliance with regulatory IT audit standards, this may also save costs for the organisation in the long run. Furthermore, it was noted that audit automation forces auditors to upskill themselves to serve as information certifiers or verifiers of the results produced by audit automation tools. This means that the IT audit profession is evolving as the role of the IT auditor is not to primarily focus on auditing manually but involves working together with audit automation tools to perform IT audits, where they apply professional judgement and professional scepticism when performing audits. All these impacts are in line with the literature reviewed for this research report.

Negative impacts

Based on the 21 Interviews conducted with IT auditors it was noted that some IT auditors may lose their jobs if they do not upskill themselves. It was also noted that audit automation tools also lead to over-reliance where some IT auditors may take results produced by IT audit automation tools at face value without interrogating the results and not applying their professional judgement/scepticism. Additionally, when the IT audit automation tools are not working, there may be a skills gap as some of the IT auditors may not be trained to perform manual audits. If the audit tools are not developed based on the relevant audit methodology and standards, the tools may not produce accurate results. Inadequate coding and inadequate testing of the tools may also result in inaccurate IT audit results. This may bring rise to cyber security issues and ethical concerns. Inadequate change management and inadequate training of IT auditors may result in resistance in using the IT audit automation tools. Furthermore, initial implementations costs, and training costs may also lead to organisational losses if the IT auditors do not use/adopt the audit automation tools as intended. All these impacts are in line with the literature reviewed for this research report.

Key takeaways

Automated audits result in a lot of benefits for IT auditors. However, the benefits and impacts are dependent on training provided by the organisations and the willingness of the IT auditors to upskill themselves. The IT audit profession is evolving where IT auditors will work together with IT audit tools to perform IT audits. IT auditors who do not evolve with the profession may lose their jobs.

Emerging contributions

Artificial intelligence (AI) was one of the emerging themes. Based on the literature reviewed for this research report it was noted that only repetitive and less complex tasks could be automated, however, AI was deemed to allow the automation of complex procedures which led the IT auditors interviewed to believe that the profession may be replaced by automation/AI in future, this was in line with Frey & Osborne, 2017, who predicted that there is a 94% probability of the audit profession (all types of audits) being automated. This prediction was made based on the assumption that automation of computerisation of tasks will improve in future. It was further noted that although AI has learning abilities that allow the automated of complex procedures, it was noted to hallucinate. Additionally, data privacy and confidentiality concerns were noted where the AI may share confidential data that should be limited to certain individuals or organisations.

5.2 CHAPTER CONCLUSION

This chapter aimed to answer the four (4) sub-research questions in the study using the model developed and theoretical framework from the literature review of this study using the data collected from the 21 individual interviews conducted with IT auditors within an IT Audit department in a South African audit firm. The following findings were noted for each research question:

Q1: How does data (data access, data analytics/data modelling and big data) affect the application of automation in IT auditing?

Data is the key enabler of audit automation the availability of quality data, correct data, structured data, accessibility of data, data with high integrity, complete and accurate data and consistent data are key to the audit automation process. Furthermore, data analytics/data modelling and big data are key drivers of audit automation.

Q2: How does the IT audit process automation affect the IT audit profession in IT auditing?

Automated audits happen on a frequent basis, e.g., monthly, weekly, daily, or real time depending on the needs of the organisation; the audit approach is proactive where potential issues are picked up before they materialise; audit procedures are automated; data analytics and data modelling are used for testing where full populations are mostly used for testing; the results of the testing are reported on a frequent basis as per the organisation's needs. This affects the skills, training that the IT audit professions must have and the role and extent of their roles when there is automation of audit procedures.

Q3: What is the effect of affordances as a result of audit automation on the IT audit process in IT auditing?

IT Auditors perceived audit automation to provide efficiency, reliability, cost cutting, greater assurance in audits and overall good quality audits. Most IT auditors indicated that the organisational culture embraces the use of audit automation as there are affordances existence. The affordances existence resulted in a affordances both positive (reduced costs, saving time, resulting in efficient audits where full populations are tested and have limited human error) and negative (high initial costs, losing professional scepticism and judgement due to overreliance, getting approval/buy-in from

stakeholders, incompatibility issues and lack of adoption in certain cases) however, the perceived benefits exceeded the cost of not using the audit automation tools.

Q4: What is the effect of affordances as a result of audit automation on the IT audit profession in IT auditing?

The IT Audit profession will not be fully automated in the short term. However, it may be fully automated eventually. The role of the auditor will change to being that of an information certifier, where IT auditors will verify results produced by audit automation tools and apply their professional judgement and scepticism when required. Those who do not adapt to changes may lose their job but those who keep up-to-date and upskill themselves will experience the evolution of their role and/or profession.

6 CHAPTER SIX – CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

This chapter outlines the contributions (academia, practice, and policy) of the study, the limitations of the study and the limitations based on methods used to conduct the study. Furthermore, the chapter outlines the recommendations based on the findings and any future research that can be undertaken.

The study contributed to the body of knowledge by filling the gaps in studies that explore the impact of audit automation on the IT audit profession in the South African context by using a case study in an audit firm. Furthermore, it contributed on new theoretical insights on how the affordance theory and the model developed using the literature review of this study can be used to understand technology adoption and the evolution of skills. Furthermore, by using a case study and interviews, the study contributed by providing a real-world scenario on how the IT audit profession is evolving as a result of audit automation.

The study contributed to practice by helping understand the skills such as advanced data analytics and AI, that IT auditors may require to keep with the evolving IT audit profession. Furthermore, it can help IT auditors predict how their roles will evolve given the automation of some of their job responsibilities and what their evolved role will look like. Additionally, audit firms can use the findings of the study to train and upskill their IT auditors to ensure that the transitioning process to using audit automation tools is smoother.

The study contributed to policy and regulation as regulators can use the findings of the study to update the relevant compliance frameworks that account for the use of audit automation tools. Furthermore, the study highlighted ethical concerns such as, privacy issues, confidentiality issues, biases encoded on the automations and AI tools that can hallucinate.

6.2 RESEARCH LIMITATIONS

The study focused on a single case study in a South African audit firm. This provided understanding of the single case, but this case may have unique characteristics which might not be representative of the experiences and perceptions across different organisations and industries. This means that the findings of this study have limited generalisability.

Furthermore, the study was a qualitative study which included a limited number of participants which may have potentially affected the comprehensiveness of the findings. Additionally, qualitative research is reliant on the interpretations of the researcher which can include subjectivity where personal bias and researcher's perceptions may influence the collection, coding, analysis of data.

6.3 RECOMMENDATIONS FOR FUTURE RESEARCH

The IT audit profession is evolving, which means that IT auditors must engage in continuous learning where they learn skills like advanced data analytics, AI, and cybersecurity. Furthermore, they must upskill themselves such that they can work together with audit automation tools by applying professional judgment and professional scepticism.

Audit firms can have procedures in place that ensure that there is no over-reliance on audit automation tools and in cases where audit automations tools fail, IT auditors are still able to perform their audits traditionally or there is timely IT support provided. Furthermore, audit firms should invest in training and upskilling of their IT auditors to ensure that they evolve with the evolving profession.

Regulators and professional bodies should ensure that their standards and regulations incorporate audit automation best practice and that audit automation tools are free from bias and are compliant with relevant laws such as data privacy and confidentiality laws.

The study was a qualitative study which had a limited number of participants. A quantitative study that includes multiple audit firms and IT auditors can be conducted to get more generalisable results. The study can further be applied to other types of auditors, as it focused on IT auditors only. It can also be conducted in multiple audit firms. Furthermore, the model derived as part of the study can be quantitatively evaluated and the relationships between the different concepts can be tested. The study can be converted into quantitative research.

The study mostly presented findings in the short term. A study to explore long term effects on the IT audit profession can be conducted. Furthermore, the psychological impacts of audit automation like job displacement and work stress related to the evolving profession can be evaluated. Additionally, the skills and training requirements that universities and professional bodies can offer can be explored.

Cybersecurity and ethical concerns as a results of audit automation can be explored. This recommended study can also explore any risks that arise due to the use of audit automation tools. Furthermore, a study that explores the frameworks that govern the audit automation tools can be conducted.

7 REFERENCES

- Alles, M. G., & Gray, G. L. (2020). Will the Medium Become the Message? A Framework for Understanding the Coming Automation of the Audit Process. *Journal of Information Systems*, 34(2), 109-130.
- Appelbaum, D., Kogan, A., & Vasarhelyi, M. A. (2017). Big Data and Analytics in the Modern Audit Engagement: Research Needs. *Auditing: A Journal of Practice and Theory*, 1-27.
- Bhattacharjee, A. (2012). *Social Science Research: Principles, Methods, and Practices* (Second Edition ed.).
- Caster, P., Elder, R. J., & Janvrin, D. J. (2021). An Exploration of Bank Confirmation Process Automation: A Longitudinal Study. *Journal of Information Systems*, 35(3), 1-16.
- Chan, D. Y., & Vasarhelyi, M. A. (2011). Innovation and practice of continuous auditing. *International Journal of Accounting Information SYstems*, 12, 152-160.
- del Val, M. P., & Fuentes, C. M. (2018). Resistance to change: A Literature Review and Emperical Study. *Emerald Insight*, 41(2), 148-155.
- Deloitte. (2022). *Deloitte*. Retrieved October 28, 2022, from Delloitte.com: www2.deloitte.com/mt/en/pages/risk/mt-risk-article-it-auditing-process.html
- DiMaggio, P. J., & Powell, W. W. (1983). The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organisational Fields. *American Sociological Review*, 147-160.
- Doolin, B., & Lowe, A. (2002). To Reaveal is to Critique: Actor-Network Theory and Critical Infirmation Systems Research. *Journal of Information Technology*, 17(2).
- Dzuranin, A. C., & Malaescu, I. (2016). The Current State and Future Direction of IT Audit: Challenges and Opportunities. *Journal of Information Systems*, 7-20.
- Eulerich, M., Masli, A., Pickered, J., & Wood, D. A. (2023). The Impact of Audit Technology on Audit Task Outcomes: Evidence for Technology-Based Audit Techniques. *CAR*, 983-1011.
- Frey, C. B., & Osborne, M. A. (2017). The future of employment: How susceptible are jobs to computerisation? *Technological Forecasting & Social Change*, 114, 254-280.
- Gartner. (2022). *Gartner*. Retrieved October 28, 2022, from Gartner.com: <https://www.gartner.com/en/information-technology/glossary/bpa-business-process-automation>
- Goodhue, D. L., & Thompson, R. L. (1995). Tas-Technology Fit and Individual Performance. *MIS Quaterly*, 19(2), 213-236.
- Guest, G., Bunce , A., & Johnson, L. (2006). How Many Interviews Are Enough?: An Experiment with Data Saturation and Variability. *Sage Journals*.
- Huang, F., & Vasarhelyi, M. A. (2019). Applying robotic process automation (RPA) in auditing: A framework. *International Journal of Accounting Information Systems*, 35, 100433.
- Huerta, E., & Jensen, S. (2017). An Accounting Information Systems Perspective on Data Analytics and Big Data. *Journal of Information Systems*, 31(4), 101-114.
- Klopper, H. C. (2008, December). The qualitative research proposal. *Curationis*, pp. 62-72.

- Kogan, A., Sudit, E. F., & Vasarhelyi, M. A. (1999). Continuous Online Auditing: A program of Research. *Journal of Information Systems*, 13(2), 87-103.
- Malterud, K., Siersma, V. D., & Guassora, A. D. (2015). Sample Size in Qualitative Interview Studies: Guided by Information Power. *Sage Journals*.
- Mkhomazi, S. S., & Iyamu, T. (2013). A Guide to Selecting Theory to Underpin Information Systems Studies. *International Working Conference on Transfer and Diffusion of IT (TDIT)*, 525-537.
- Momami, A. M., Jamous, M. M., & Hilles, S. M. (2018). Technology Acceptance Theories: Review and Classification. *IGI Global*.
- Oates, B. J., Griffiths, M., & McLean, R. (2022). *Researching Information Systems and Computing* (Second Edition ed.). Sage.
- Pizzi, S., Venturelli, A., Variale, M., & Macario, G. P. (2021). Assessing the impacts of digital transformation on internal auditing: A bibliometric analysis. *Technology in Society*, 67, 101783.
- Rikhardsson, P., & Dull, R. (2016). An exploratory study of the adoption, application and impacts of continuous auditing technologies in small businesses. *International Journal of Accounting Information Systems*, 20, 26-37.
- Rosenthal, R. (1994). Science and Ethics in Conducting, Analyzing, and Reporting Psychological Research. *American Psychological Society*, 5(3), 127-134.
- Rowe, F. (2014). What literature review is not: diversity, boundaries and recommendations. *European Journal of Information Systems*, 23(3), 241-255.
- Setty, K., & Rohit, B. (2013). What Is Big Data and What Does It Have to Do With IT Audit. *ISACA Journal*.
- Tatnall, A. (2023). *Innovation Translation, Innovation Diffusion and the Technology Acceptance Model: Comparing Three Different Approaches to Theorising Technology Innovation*. Melbourne: Graduate School of Business, Victoria University.
- Titera, W. R. (2013). Updating Audit Standard - Enabling Audit Data Analysis. *Journal of Information Systems*, 325-331.
- Vasarhelyi, M. A. (1993). Automated Dynamic Audit Programme Tailoring: An Expert Systems Approach. *Auditing: A Journal of Practice & Theory*, 12, 190-193.
- Vasarhelyi, M. A., Alles, M., Kuenkaikaw, S., & Little, J. (2012). The acceptance and adoption of continuous auditing by internal auditors: A micro analysis. *International Journal of Accounting Information Systems*, 13, 267-281.
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly*, 425-478.
- Volkoff, O., & Strong, D. (2017). Affordance Theory and How to Use it in IS Research.
- Wang, H., Wang, J., & Tang, Q. (2018). A Review of Application of Affordance Theory in Information Systems. *Journal of Service and Management*, 11, 56-70.
- Zhang, C. A., Thomas, C., & Vasarhelyi, M. A. (2022). Attended Process Automation in Audit: A Framework and A Demonstration. *Journal of Information Systems*, 101-124.

8 APPENDIX A: RESEARCH INSTRUMENT

Interviews using concepts from the research framework were used.

Test questions

- a) Do you know what audit automation is?
- b) If any, which audit automation tools do you know/use?

Questions

- 1a) How does the availability of data (as an enabler) affect the automation of IT audit procedures?
- 1b) Are you aware of other audit automation enablers?
- 2 a) How does data affect the automation of audit processes?
- 2 b) How does the IT audit process/methodology affect the automation of the audit procedures?
- 3a) Have you had any difficulties using traditional auditing methods?
- 3b) Are you aware of any difficulties when using traditional auditing methods?
- 3c) How does your organisation perceive the use of audit automation?
- 3d) What is the organisational behaviour on the use of audit automation?
- 4a) What benefits do you get from using automated IT audit procedures (IT audit automation tools)?
- 4b) Are you aware of any benefits of using automated IT audit procedures (IT audit automation tools)?
- 5a) Have you received any training to use audit automation tools?
- 5b) What is the perception of audit automation tools in your department?
- 5c) Do you think that the IT audit profession can be fully automated (replaced by automation)?
- 5d) What are the disadvantages if any of using automated audit processes?
- 6) What are your thoughts on the use of audit automation?

Demographics

Gender: Male Female Other

Age: 22-34 35-47 48-60 60 and above

IT audit experience (In years):

Experience with using IT audit automation tools (In years):

9 APPENDIX B: CONSISTENCY TABLE

Research Question ID	Research Question	Themes	Data Collection	Interview Questions ID	Data Analysis
Q1	How does data (data access, data analytics/data modelling and big data) affect the application of automation in IT auditing?	DATA • Data Access • Data Analysis/Data Modelling • Big Data	Interview	1a, b, 2a, b	Thematic analysis
Q2	How does the IT audit automation process affect the IT audit profession in IT auditing?	AUDIT PROCESS • Continuous Auditing (CA) and Continuous Monitoring (CM) • IT Audit Process Automation	Interview	3a, b	Thematic analysis
Q3	What is the effect of affordances as a result of audit automation on the IT audit process in IT auditing?	AFFORDANCE THEORY COGNITION PROCESS • IT Artefact • Affordances exitance • Organisation RECOGNITION PROCESS • Affordances Perception BEHAVIOR	Interview	3c, d, 4a, b, 5a, b	Thematic analysis

Research Question ID	Research Question	Themes	Data Collection	Interview Questions ID	Data Analysis
		• Affordances Actualisation • Affordances effects			
Q4	What is the effect of affordances as a result of audit automation on the IT audit profession in IT auditing?	IT AUDIT PROFESSION • IT Audit Profession Automation • Role of Auditor	Interview	5c, d	Thematic analysis

10 APPENDIX C: CONSENT FORM

Consent Form

THE IMPACT OF AUDIT AUTOMATION ON THE INFORMATION TECHNOLOGY (IT) AUDIT PROFESSION (A CASE OF A SOUTH AFRICAN AUDIT FIRM)

Name of Researcher: Lydia Dlamini

I, ..., agree to participate in this research project.

I agree to the following:

(Please circle the relevant options below)

The research study was explained to me. I understand what this study is about.	YES	NO
--	-----	----

I understand that I can volunteer to take part in the study.	YES	NO
--	-----	----

I agree that the interview may be audio recorded.	YES	NO
---	-----	----

I agree that direct quotations from my interview may be used by the researcher in their research report/ manuscript/book chapter.	YES	NO
---	-----	----

I agree that my participation will remain anonymous (my name or other identifying data will not be used by the researcher in their research report/manuscript/book chapter).	YES	NO
--	-----	----

I agree that other researchers may use the information I provide in my interview (depending on their own ethics clearance being obtained) but my name and any personal information will not be used or passed on.	YES	NO
---	-----	----

..... (signature)

..... (name of participant)

..... (date)

11 APPENDIX D: ETHICS CLEARANCE



SCHOOL OF BUSINESS SCIENCES ETHICS COMMITTEE
CONSTITUTED UNDER THE UNIVERSITY HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)

CLEARANCE CERTIFICATE

PROTOCOL NUMBER: CBU SE2291

PROJECT TITLE

The impact of audit automation on the Information Technology (IT) audit profession (In a South African Audit Firm)

INVESTIGATOR

Lydia Dlamini

SCHOOL/DEPARTMENT OF INVESTIGATOR

School of Business Sciences

DATE CONSIDERED

20 November 2024

DECISION OF THE COMMITTEE

Approved Unconditionally

RISK LEVEL

Low Risk

EXPIRY DATE

31 December 2027

ISSUE DATE OF CERTIFICATE 22 November 2024

CHAIRPERSON


(Neetu Ramsaroop)

cc: Supervisor: Neetu Ramsaroop

DECLARATION OF INVESTIGATOR

To be completed in duplicate and **ONE COPY** returned to the Chairperson of the School/Department ethics committee.

I fully understand the conditions under which I am authorized to carry out the abovementioned research and I guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee.



Signature

Date

25 / 11 / 2024

12 APPENDIX E: TURNITIN REPORT SUMMARY

Lydia Dlamini_Research Report_Final-1.docx			
ORIGINALITY REPORT			
9%	7%	6%	%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS
PRIMARY SOURCES			
1	docslib.org Internet Source	1	%
2	wiredspace.wits.ac.za Internet Source	1	%
3	core.ac.uk Internet Source	<1	%
4	www.coursehero.com Internet Source	<1	%
5	Gomez, Samantha Esmeralda. "Compare and Contrast the Extent of Content Compliance in Public Performance Audit Reports Published in South Africa and Australia", University of the Witwatersrand, Johannesburg (South Africa), 2025 Publication	<1	%
6	www.researchwithrutgers.com Internet Source	<1	%
7	scholar.mzumbe.ac.tz Internet Source	<1	%
8	theses.liacs.nl Internet Source	<1	%
9	Ceki, Babalwa. "A Model for the Adoption of Technologies by Supreme Audit Institutions.", University of Johannesburg (South Africa), 2024 Publication	<1	%