Transforming Internal Audit into using Blockchain Technology within the Department of National Treasury in Bloemfontein

BY

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DECLARATION

I, LESEGO ASSEGAAI, confirm that the work for the following paper with the title:

Transforming Internal Audit into the using Blockchain Technology within the Department of National Treasury in Bloemfontein.

was solely undertaken by myself and that no help was provided from sources other than those allowed. All sections of the paper that use quotes or describe an argument or concept developed by another author have been acknowledged and referenced, to show that this material has been adopted to support my research

On the _____ day of _____ 202__at Cape Peninsula university of Technology, District Six campus, Cape Town.

Signature _____

DEDICATION

It is my honour to dedicate this work to my dear children and trust that one day they will take after me and keep the light shining. Know that you are queens, be gentle and caring to others like you always have been. To my mother, Kwena *"floating on the water protecting her territory and enemies cannot see her in the brown water looked like her hard skin covered with black and brown stripes".* You always stayed calm and guided me until the end. You believed in me and helped me reach my potential, you said "be the difference you what to see" I believe this thesis is my contribution to make difference.

Most of all, I would like to dedicate this piece work to all my fellow women who have dreams but have been discouraged from following them. They have put other things before themselves and stopped living their 'dream'. Let this work be an encouragement to all of you, to follow your dreams and to know that GOD has given us wisdom and strength to become whatever we aspire to be. We are "*Indlovukazi"* and true to the saying that: *"Wa thinti umfazi, wa thinti imbongoto"*. We bear the strength to do anything we put our minds to. Our hands are made of gold with strength and worth.

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ABSTRACT

The study seeks to investigate the adoption and potential application of Blockchain Technology (BT) in a public sector treasury environment. The process of BT adoption by its nature is highly technical hence the need to craft a framework for the organizational and operational strategies for the Bloemfontein Treasury environment. The expected benefit of BT adoption would be that it provides for the immutable, reliable and visible traceability of records. This process will also offer accountability and transparency which may boost the operations of the internal audit activity (IAA). BT involves contemporary technology that can be manipulated for use in some large-scale organizational settings because of its potential for managing complex processes. This study also discusses numerous significant application areas associated with BT for internal controls. Internal auditors can use BT to provide maximum value on governance, risk management processes, and the implementation of the provisions of the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

The study followed a qualitative approach, the findings were from the sample of seven (7) respondent that do not represent the entire population in internal auditing. The data collection, processing and analysis. A schedule of interviews was employed for collecting data. The questionnaire was analysed using descriptive statistical tables and graphs, while the interviews were analysed thematically but in reference to the research objectives. It was found out that the Free State Provincial Treasury in Bloemfontein has failed to invest in IAA in the form of obtaining new skills and knowledge progression. The IAA was willing to test and adopt BT to enhance its performance in the organization.

This study contribution describes the potential drivers and drawbacks of BT in the IAA adoption, as well as the effects of its implementation. This study also has provided the theoretical contributions for determining BT advancement on the innovation curve, thus, as of now, possibility of adopting and advancing BT is on course. Organizations should be at the forefront of technology development that should be invested on BT, and that could reach new heights of adoption and implementation of the all the processes it involved.

Keywords: Accountability, Blockchain Technology**,** Internal Auditing, Public Sector and Transparency.

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LIST OF ABBRIVIATIONS

AICPA – American Institute of Certified Public Accountant

ATM – Automated Teller Machine

BC – Big Chain

BFT – Byzantine Fault Tolerance

BT – Blockchain Technology

CBA – Commonwealth Bank of Australia

COSO – Committee of Sponsoring Organisation of the Treadway Commission

ERM – Enterprise Risk Management

ETL – Extraction Transformation and Loading

EU – Europe

EVM – Ethereum Virtual Mechanism

IA – Internal Auditor

IAA – Internal Audit Activity

ICFR – Internal Control over Financial Reporting

ICT – Information and Communicated Technology

IOD – Injury on Duty

IoT – Internet of Things

IP – Internet Practice

IPPF – International Professional Practice Framework

ISO – International Standardisation for Organisation

IT – Information Technology

KSI – Keyless Signature Infrastructure

MFMA – Municipal Finance Management Act

PAR – Participatory Action research

PBFT – Practical Byzantine Fault Tolerance

PFMA – Public Finance Management Act

PKI – Public Key Infrastructure

PoW – Proof of Work

PWC – Price Water Coopers

QU – Query Update

RBFT – Robust Byzantine fault tolerance

RTGS – Real Time Gross Settlement

SA – South Africa

TCP – Transmission Control Protocol

UK – United Kingdom

CHAPTER ONE

INTRODUCTION AND ORIENTATION OF THE STUDY

1.1 INTRODUCTION

For many years the internal auditing profession has been recognised within organisations for providing accountability and transparency services and, thereby, playing a significant role. Internal auditors serve the best interest of the organisation by providing high quality insightful internal auditing reports to the users, and stakeholder rely on the internal audit report to present fair, honest, material and immaterial findings (Dai & Vasarhelyi, 2017). Despite the impact of internal auditing activity (IAA) for enhancing quality and relevance, some organisations use ancient techniques that are hampered by a lack of efficient technology solutions, and some organisations are also concerned with the IAA's independency (Motubatse, Barac & Odendaal, 2015). Moreover, independency and unlimited scope enhance the ability of an internal auditor (IA) to make unbiased recommendations and to evaluate the level of transparency and accountability in the process (Jachi, 2019; Kimotho, 2014; Holt & DeZoort, 2009;). However, recent technological advancement is providing an opportunity to rethink the conducting of internal audit engagement procedures. Assurance engagement is performed to evaluate the reliability of evidence obtained by performing substantive procedures on the balances and transactions in order to test the appropriateness and efficiency of internal control system and procedures. Consulting engagement requires collecting data for analysis and evaluating the relevance of information in terms of the objective of the internal auditing engagement.(Bubilek, 2017).

Meanwhile blockchain innovation, as part of Information and Communication Technology (ICT) continues to develop rapidly and this process guarantees security and protection, particularly, for monetary and web-based business applications. The tremendous development of digital currencies uses the quick improvement, Mohamad et al., (2020a) of blockchain innovation and provides immutable record frameworks without a central controller. In the blockchain network, the records are made public basically to all users and clients and each square has a cryptographically connected association with its past block after approval. Blockchain keeps developing, as is indicated by the exchanges, and, subsequently, by being added to the new squares. Each square contains a hash esteem regarding the substance of the past block in the blockchain network. (A hash is a technique that has various roles used in a

blockchain and decentralised mechanism (Simon, Kasale & Manish, 2018). Blockchain innovation has effectively empowered online business frameworks such as Bitcoin, Ethereum, Litecoin and Ripple. It has been extensively utilised for an assortment of practices. Four distinct types of blockchains are accessible and dependent upon the availability of the information and activities. They are Public Consent Blockchains, Private Blockchains, Consortium Blockchains and Hybrid/Blockchainified. Blockchain innovation has been generally utilised in various fields such as the Internet of Things (IoT), financial related training, and finance and auditing.

Globally, technology has the effect of changing the way organisations conduct their businesses and one form of technology that offers benefits for efficient operations is the Blockchain technology (BT). BT is a distributed ledger recording technology, that ensures data security transparency, accountability and data integrity (Waldport 2016; Zhu & Zhou, 2016). Kshetri (2017) is of the opinion that BT safeguards against unlawful practices, it enables organizations to keep an audit trail of transactions and records. In this way, accountability and transparency can be achieved through the BT data-exchange process. According to Kshetri (2017), data manipulation is practically impossible to achieve without getting caught in simple explanation, BT is impossible to alter because it is a permanent transaction. BT can be used to prevent unforeseen frauds such as those observed in Qingdao and the Adoor Sree Narayana Dharma Paripalana Union. BT is an introductory transformation showing how records are created, preserved and updated, with the approach of distributing records among all users it constitutes an open ledger rather than being a sole ownership of records, (Mohamad, Abdurrahman & Keong, 2020). This approach creates worldwide entry bookkeeping system through which transactions and records are shared identically and permanently with all participants. BT also seizes control and has authority and custody over records (Lemieux, 2019; Markey-Towler, 2018).

Moreover, internal auditors in the public sector are faced with the ever-changing system of ‘what, when, why, how and others’ regarding their responsibilities at work, which places them in a position that under-estimates their abilities. To address such a paradigm shift, the study focused on IAA in a way that will minimise unnecessary pressure by looking at the BT impact and progress. Benchmarking for instance is a tool used in the implementation of the total quality management approach which applies not only to the business or to the operating processes of an organisation but also to other activities such as internal audit processes (A. Hazaea et al., 2021). It also, describes a technique for improving the effectiveness of

benchmarking which is a means of helping an organisation with effective IAA and business re-engineering. Ojo and Adebayo (2017), attribute respect to countries which are already using the BT in the auditing space because such practices may influence others to emulate their action.

1.2 Problem Statement

In the Free State, the ineffectiveness of IAAs in the Provincial Treasury has been manifested in delayed internal audit engagements and reports and one may question the reasons for this low productivity. Notably, inefficient IAA in use currently emanates from factors such as lack of management support, limited budgets and time (to procure the right system), limited scope, lack of independence, computer compatibility and appropriate IT knowledge by the audit team, corruption and loss of data (A. Hazaea et al., 2021; Motubatse et al., 2015). Effective IAA provides relevant information and recommendations for good governance, risk management and internal controls in form of internal audit reports. Nteziyayo, (2014).

While provision of these above-mentioned services is beneficial, the result of their omission includes the deployment of ineffective and insufficient technological solutions, plus limited independence and scope (Weiss, Botha, Herselman & Loots, 2017) These authors further suggest the introduction of BT as a security infrastructure, because this technology ensures traceability (Moon, 2016) and government open data, (Dai & Li, 2016; Kozlowski, 2016). BT develops data analytical systems and can explore extensive quantity of data in different structures and formats which traditional analytical procedures cannot engage with. According to Pedro, Manuela and Costa (2018), accountants and IAs are not yet acquainted with BT and do not have the necessary knowledge and skills to use it.

These researchers further mention that accountants and IAs cannot identify the risks and shortcomings of the technology, form a professional judgment nor provide recommendations on governance, risk management and internal control processes. Pedro et al, (2020) state that, the fundamentals of BT can be used as a verification tool for reported transactions and, instead of the IA having to ask for confirmation letters and bank statements from third parties, an IA can easily verify the transactions from blockchain ledgers and access the necessary documents.

The digital verification process will improve IAA environment (Ellis & Levy, 2008) because the application of complex models makes it difficult for the organization to transform or adopt

new approaches (Woodside, Augustine & Giberson, 2017; Young, 2016). The successful use and adoption of BT has been documented but may vary from country to country. BT adoption seems slow due to a lack of knowledge regarding the regulatory requirements (Dai, 2017), namely Industry 4.0 and Audit 4.0, which, although excessive, are transforming and influencing some industries and companies, including electrical and financial industries.

According to Ernst and Young (2015), transforming IAs will create more opportunities for the profession. Sample-base testing will include analysis of the entire population of audit-relevant data processes (transactions and master data from key business), using sharp analytics to deliver a high quality of audit evidence, results and more relevant business insights and recommendations. Big data and analytics are allowing IAs to identify fraud 'red flags' and operational business risks to minimise challenges and modify their approach to perform and deliver a more relevant internal audit engagement process and report.

The significance of the study was to introduce BT to IAs and present how BT may be beneficial to IAA and the organization, as it was indicated that IAs were not familiar with BT. The researcher discovered that technology innovations was not encouraged in the IAA and skill and knowledge development was limited. The study was to introduce BT to IAs and to transform the traditional processes carried by IAs during internal audit engagements. Furthermore, the researcher also discovered that literature about the use of BT for internal auditing is limited. Therefore, study intends to investigate whether the solutions offered by BT can be applied to the problems currently experienced by the Free State Provincial Treasury in Bloemfontein.

1.3 Rationale and Significance of the Study

The rationale behind this proposed study arose from the conversation with the IAs about BT. During the conversation, they indicated that there are issues about independency, confidentiality and proficiency, whereby external auditors have to rely on the organisation's internal audit report. They also indicated that they were not familiar with BT. The researcher also discovered that literature about the use of BT for internal auditing is limited. Therefore, the study may form a good basis for designing procedures for the introduction of the BT. This process might contribute as well to the existing dearth of literature on this particular auditing process. It is also hoped that it may encourage internal audit

professionals to start considering the use of BT based upon an appropriate informed strategy

Mavilia & Pisani, (2021), conducted a study on Blockchain in Agricultural sector the study demonstrate how is possible, through the BT new technological tools, to mitigate the counterparty risk in agricultural transactions up to eliminating them, making secure payments and allowing the traceability and transparency that agricultural value chains need that this application focuses on the supply chain, produced on a South African farm. Weiss, Botha, Herselman, & Loots, (2017), agues how blockchain can be beneficial for public health in south Africa Implementing blockchain as a security infrastructure could therefore be viable alternative in fulfilling fiduciary obligations for processing of personal information for example, as blockchain provides traceability, the ability for the National Department of Health to prove that a patient has accepted a particular version of the terms and conditions of an application is now possible, the encryption of patient information as well as the capturing of the unique identity number of the healthcare worker administering the service

Ndayizigamiye & Dube, (2019), also carried out a study on how BT promises to enhance healthcare systems by providing a platform whereby transactions are immutable and traceable within a decentralised ledger. They argued that blockchain can contribute to strengthening the South African public healthcare sector by fostering accountability and transparency in patient-centred services. However, since blockchain is a fairly new technology, there is a need for developing standards that define how data is imported from outside blockchain distributed ledger. In addition, there is a need for a regulatory framework that govern when and how data can be accessed by a third party within the public healthcare continuum. Lastly, (Khan, 2018) carried out a study on haw bitcoin and BT that have the potential to change the baking sector, and more importantly the bitcoin is used through the BT channels.

This study focusses on enhancing the procedures IAs use to plan the internal auditing engagements and to enhance the existing knowledge and skills of IAs with BT innovation and how it can be beneficial to the IAA and the organisation. The is a need to build a network that could help in Blockchain technology task with its convening power. Take initiatives and identify capacity development needs. Engage with research institutions and blockchain associations across the country and collaborate with blockchain innovation hubs. The knowledges, skill and education levels on blockchain and other advanced technologies in South Africa is low, Creation of educational programmes for users, innovators and policy-makers.

On the one hand, this poses a problem to attract adequate talent for solution development because of lack skill for BT. Foster to meetup and event culture that is typical for BT implementation, adoption and use. It serves to connect, IAs, policymakers, corporates and the larger ecosystem. IAs could go abroad for training to understand BT and intensify collaboration between BT and organisation

The justification for this study, is the possible contribution to the body of knowledge in the IA field, so far as IAA of organisational knowledge and skill deficiency is concerned. It is also to reduce existing gaps in the literature. In the empirical and theoretical literature transforming IAA into adopting and use BT as well as the organisational. IAs knowledge skill shortage, pose as a challenge resulting from BT implementation. But what organisation have missed from their predominantly theoretical perspective, is IAs that needs continuous skill and knowledge empowerment and effective knowledge management in practice is largely dependent upon human resource management (Gope et al. 2018; Zaim et al. 2018). Practical components such as recruitment of talent, training, succession planning and rewards management systems play a central role in the knowledge and skill empowerment and retention process. In South Africa, the issues of BT innovation and other technological innovation, skill shortage and lack of knowledge which have not been addressed in public organisations, however, purely from BT innovation lack of knowledge and skill in organisations cannot be left only to the IAs, it is also an area of concern for organisation. Thus, IAs has a critical role in the knowledge and skill development and retention process. The important contribution of this study will be the enhance the IAs the knowledge, skill and adoption of BT processes in organisations as well as to its transform its internal auditing practices.

Note that past research generally has not conducted research in blockchain and Internal auditing adoption. The literature reviewed on the phenomena show a need to transform IAA practices and enhance knowledge and skills of IAs in the BT. Papa et al. (2020) from the conceptual, empirical perspectives, the key issue is to understand how the deployment of BT strategies may best facilitate transformation, and adoption processes in the organisation, (Papa et al. 2020; Gope et al. 2018; Vaiman & Vance 2008).

1.4 Research Aim

The focus of the study was to investigate and transform IAA of Free State, Provincial Treasury in Bloemfontein through the use of BT.

The process was to contribute to the existing theory and practice of BT as an IAA

1.5 Research Objectives

1.5.1 To determine how traditional financial transactions and corporate reporting (accountancy function), differ from financial transactions and corporate reporting (accountancy function) that make use of Blockchain technology

1.5.2 To determine how traditional internal audit methodologies, differ from internal audit methodologies that make use o Blockchain technology.

1.5.3 To determine how BT can enhance the internal audit function.

1.5.4 To determine the challenges that internal audit functions face in adopting and using Blockchain technology.

1.6 Research Questions

1.6.1 How do traditional financial transactions and corporate reporting (accountancy function), differ from financial transactions and corporate reporting (accountancy function) that make use of Blockchain technology?

1.6.2 How do, traditional internal audit methodologies differ from internal audit methodologies that make use of Blockchain technology?

1.6.3 How can Blockchain technology enhance the internal audit function?

1.6.4 What challenges do internal audit functions face in adopting and using Blockchain technology?

1.7 Definition of Concepts in the Study

Internal Auditing: "An independent objective assurance and consulting activity designed to add value and improve an organization's operations. It helps an organisation to accomplish its objective by bringing a systematic disciplined approach to evaluate and improve the effectiveness of risk management, control and governance processes" (Coetzee, du Bruyn, Fourie & Plant, 2014:11)

Public, Sector: This is the process characterized by the public sector's wings of governments, and all publicly controlled or publicly funded agencies enterprises and other entities that deliver public programmes goods or services. (Institute of Internal Auditors Global, 2011).

Transparency: - BT safeguards transparency by storing, information and it cannot be altered without recording the changes made. (Rizal Batubara et al., 2019). The record or transactions are visible to anyone. BT makes records available, thus, it is impossible to hide transactions, hance it enhances honesty. BT is transparent and creates secure auditable paper trails, (Swan, 2015).

Accountability: This concept means, being, held responsible for the past events and decisions made in the financial accounting interest of the organisation. BT foster cooperation with and accountability of global institutions via mechanisms which reintroduce transparency and traceability into human momentary governance, (Rizal Batubara et al., 2019).The process holds identifiability as a precursor to accountability and liability to ones actions (Batubara, Ubacht, & Janssen, 2019)**.**

Transformation: This denotes organizational development movement to build with the aim of helping socio change work to become more effective and sustainable. (Rizal Batubara et al., 2019).

Blockchain, Technology: Blockchain is a public ledger of all Bitcoin transactions that have been executed. It is constantly growing as a miner new block (every 10 minutes) to record the most recent transactions. The blocks are added to the blockchain in a liner chronological order (Swan, 2015).

Empowerment theory: Empowerment involves improving quality by increasing an individual's knowledge of doing something (Sharma, Sharma, 2019).

Critical, Theory: Social theory leaning toward reviewing, and, changing society as a whole. The intention of this theory is to uncover assumptions of social life that prevent human beings from understanding of how the world works (Crossman, 2019).

1.8 Research Technique

1.8.1 Research Paradigm and Research Technique

The study adopted Subjective Epistemology as a theoretical lens. The lens is informed by the researcher's interaction with participants to gain insight and to formulate a clear understanding about the phenomena and on how IAA may adopt the use of BT. The study looked at the real-world of participants and their overall experiences in the research development discourse. The researcher processed the general opinions of participants by exploring their experiences and views about IAA in the use of BT in their situation or context, (Bogna, Raineri & Dell, 2020 cited by Denzin & Lincoln, 2013).

1.9 Methodology: Qualitative Research

The study adopted the qualitative method as a research approach. Qualitative research is an all general term used to describe a number of approaches and techniques for collecting and interpreting research information (Mayring, 2019; Creswell, 2014). Characteristically the qualitative research technique is descriptive, ethnographic and anthropological in nature. Furthermore, in contrast to quantitative research, qualitative research usually contains a smaller number of research subjects but is set inside a wider contextual framework and is, thus, a close and concentrated method. The overall result is typically descriptive(Creswell & Poth, 2016).

Moreover,(Boddy, 2016) who are among the most frequent cited protagonist of experimental design in behavioural science, echoed the above sentiments by stating that, while strongly advocating the use of experimental design they nonetheless were aware that the initial enthusiasm for experimentation that dominated the field of education in the early 1900s had given way to apathy and rejection and, finally, to the adoption of new psychologies that are not amendable to experimental verification (Sim et al., 2018a). In support of this view, (Majid, 2018) observed that research in the behavioural science had adopted the experimental approaches used in the natural science.

1.9.1 Motivation for the Research Method Adopted

The research method adopted for this study is a qualitative technique because it is comprising detailed fact finding and analysis. Bubilek (2017) states that qualitative research is a gump term for a wide variety of approaches and methods for the study. The information or data collected and analysed is primarily (but not, exclusively) non-quantitative in character. This research project is a philosophical study that asked "how", "what", "where" and "when" questions (Greener & Martelli, 2015). According to Atlas (2017), investigative research is used primarily to gather information and to understand the reasons, opinion and motivation regarding the problem and assists in establishing the ideas and speculations for qualitative research. This technique uncovers trends in thought and opinions which make one probe deeper into the problem. This method enhances the implementation and collects data through group discussions, interviews and observation.

1.9.2 Key Aspects of the Qualitative Research

Creswell and Poth (2016) define, qualitative design as an inquiry process of understanding based on distinct methodological traditions of inquiry that explore social and human problems. The researcher constructs a complex whole picture analyses words reports detailed views of participants and conducts the study in a natural setting. The researcher used unstructured questionnaire, which is primarily face-to-face interviews and discussion as the instrument to collect data. In additional, the researcher personally asked the questions and take part in the discussion regarding the project.

1.9.3 Relevance of the Research Method to the Study

The qualitative research method involves unstructured interviews and open-ended questions for generating data, thus enabling the researcher to interact with the participants and give them more detailed information about the topic being discussed.

1.10 Research Design

According to Creswell, (2014:259), research design is defined as "a set of methods, procedures and techniques used in collecting and analysing the variables specified in the research problem". Akhtar, (2016) likewise says that research design is a conceptual outline

of the collection, measurement, and analysis of data. This study adopted the qualitative research method by conducting open-ended semi-structured interviews.

.In essence, the study is titled towards Participatory Action Research (PAR) which according to (Ayaya et al., 2020) is to seek to understand and improve the situation by changing it into a collective, self-reflective investigation that researchers and participants undertake, so they can understand and improve upon the practices in which they participate and the situations in which they find themselves. The reflective method is directly linked to action, influenced by the understanding of history, culture, local context and surrounded in social relationships. The process of PAR should be empowering and lead people to having control over their lives adapted from, (Sendall et al., 2018; Brandenburg et al., 2015)

Additionally, Kermmis, McTaggart, and, Nixon, (2014) advocate that the purpose of the PAR design is to involve people jointly in the advent of a social world. This practice is accomplished by thinking, acting, perceiving the situation from various angle and relating to one another differently by constructing other practice architectures to enable and compel the practices in numerous ways that are productive and sustainable. The PAR design was selected for the study because it assisted the researcher to obtain in-depth understanding and information from the sample population and to focus on the characteristics that are under consideration, Sendall et al., 2018; Cardoso et al., 2017).

PAR encourages participations and ability progress Ayaya et al., (2020) with the aim of empowering social change. This practice may further inform the cooperation of participants by means of various types of knowledge and skills' proficiency to engage in the distribution of knowledge growth. Learning strengthens participants' confidence, capabilities and use of resources. In addition it develops their skills in gathering, analysing data, and using data (Sendall et al., 2018). The process of PAR is beneficial, because it provides both insight and understanding that reflect on social issues and create awareness levitation for participants (; Ayaya et al., 2020; Brandenburg et al., 2015). Social groups, in relationship with teamwork with the researcher, focus on the present social issues and concentrate on areas where change is needed (Sendall et al., 2018; MacDonald, 2012; Baum et al., 2006).

In addition, PAR has limitations due to the attachment of participators who may possibly struggle to continue their obligation during the study (Ayaya et al., 2020). PAR is unpredictable and requires knowledge about the community (Sendall et al., 2018; Brandenburg et al., 2015). Furthermore, there may be conflicting viewpoints and beliefs amongst community members in determining the social issue to focus on, and the timeframes for change,(Sendall et al., 2018)

The researcher used the interview technique that, when applied in PAR, "enables participants to describe their situation" (Ayaya et al., 2020). Interviews are a part of data collection process that provides the researcher with in-depth understanding through engaging with participants who provide descriptions of human experiences. quoting Reinhartz (1992:19), states that "interviewing offers researchers access to people's ideas, thoughts, and memories in their own words, rather than the words of the researcher". Cardoso et al., (2017) similarly, general topics assist the researcher to find the participants point of view and how they structure their responses,

In this study PAR was selected to assist the researcher to obtain an inclusive view of the real-life experiences about IAA at the Free State Provincial Treasury in Bloemfontein, Motheo District and to construct decent and satisfactory description perception about transforming the IAA into the use of BT.

1.11 Demarcation of the Study

The study was conducted at the local government offices in the Motheo District of the Free State, Provisional Treasury, Bloemfontein.

1.12 Population

A population may refer to an entire group of people objects events or measurements (Kenton, 2020.). Majid, (2018) acknowledges that it is a group of individuals who have the same characteristics. A population may refer to an entire group of people objects events or measurements. A population can thus be said to be an aggregate observation of subjects grouped together by a common feature. The population for this study comprised of eight (8) IAs, who are currently working for Free State, Provincial Treasury in Bloemfontein.

1.13 Sampling Technique

The sampling technique chosen was purposeful sampling. This technique allows researchers to select participants who can provide in-depth, comprehensive information about the phenomena under investigation (Sim et al., 2018; Boddy, 2016) . In this study purposeful sampling allowed the researcher to select participants based on specific characteristics to build a sample that was of appropriate size and comprised individualities with the requisite qualities. The study's objective was, to include stratification which means the participants drawn from the Free State, Provincial Treasury in Bloemfontein, met the following specific criteria (Fekedulegn et al., 2019).

a) Participants must be working as an IA.
b) Participants must be working at the Free State Provincial Treasury in Bloemfontein
c) Participants must meet gender and nationality equity requirements.
d) Participants must have attained the requisite educational standards and possess the appropriate qualifications and number of years of work experience in the field being studied.

1.13.1 Sample Size

Sample is a component selected with the intention of discovering information about the total population (Jomar et al., 2021). The Free State Provincial Treasury consists of seven (7) IAs in the IAA. The researcher only targeted the Free State, Provincial Treasury, thus the participants were seven (7), with consideration of ensuring gender equity and inclusion of the new entrants to the system as well as the long-term servers.

Hill et al. 2014: p. 2; Middlemiss et al. 2015; Jackson et al. 2015), have defined data saturation in a similar way seem to adopt a narrower, more individual-oriented perspective on data saturation, whereby saturation operates not at the level of the dataset as a whole, but in relation to the data provided by an individual participant, i.e., it is achieved at a particular point within a specific interview. Probing needs to continue until the researcher feels they have reached saturation, a full understanding of the participant's perspective

The principle of saturation considered in determining the sample size, the Inductive thematic saturation relates to the emergence of new codes or themes focuses on the identification of new codes or themes and are based on the number of such codes or themes rather than the completeness of existing theoretical categories. This can be termed inductive thematic

saturation. In this model, saturation appears confined to the level of analysis; its implication for data collection is at best implicit.

1.14 Data Collection Instrument

The following data collection strategies were employed:

1.14.1 Interview Questionnaires

Interview questionnaires were given to the participants, and this saved time and money. The participants were asked to be honest in answering the questionnaires regarding provocative matters, as responses were anonymous, (Vasileiou et al., 2018). There were possible limitations that participants may not answer the questions and the chances of not returning the questionnaires. However, the benefits of questionnaires in the study allow the researcher to explain the study to the participants particularly in IAA and the participation rate was high (Creswell & Poth, 2016).

1.14.2 Interview Technique

1.14.2.1 Face-to-face

An interview in qualitative research is a unique form of discussion which provides the researcher with empirical data about social life, by asking participants about their experiences The interview allows the researcher to gain insight and understanding of the phenomena under investigation (Bryman, 2016).

This study used semi-structured questionnaires and an interview as instruments to collect data from the participants. The researcher read statements and used prearranged open-ended questions throughout the interview to encourage the participants to provide their views and experiences concerning IAA and its possible transformation through the use of BT (Godoy et al., 2021).

Face-to-face interviews played a significant role in the data collection process and allowed the researcher to build a relationship with the participants and to obtain a maximum response. This technique allowed the researcher to explain some confusing statements and questions and to pursue follow-ups to the participants' responses. The researcher audiotaped the interviews and took notes to support the recordings for analytical purposes. The shortcomings of this method

of investigation data includes the possible use of a large sample which requires expending excessive time and money

1.15 Data validation

The researcher's supervisor assessed the appropriateness of the formulated questionnaire in order to ensure that it measured what it was expected to measure, thus assuring content credibility. A pilot study often exposes errors and helps the researcher to determine the participants' possible responses to the questions (Babbie, 2020). All the necessary procedures for conducting a pilot study for this research were considered after which it was conducted via email to identify any confusing elements in the questionnaire. This process assisted the researcher to determine the relevant data-collection tools and the anticipated responses. The questionnaire contained short sentences, which permitted the researcher to obtain easily understandable responses to the questions, thereby saving time and expense (Boddy, 2016). Upon receiving the results of the pilot study some amendments were made to the questionnaire, after which it was distributed to the main sample participants through email.

The research findings were made creditable by applying the triangulation approach during the analysis of the collected data because this process limits any discrepancies in the findings. The study produced findings that are persuasive and believable and included both positive and negative findings to add authenticity to the study.

1.16 Data Collection/ Fieldwork

The researcher requested and received permission from the Free State Provincial Treasury in Bloemfontein to conduct this research project. The researcher likewise requested and received ethical clearance from Cape Peninsular University of Technology to conduct the study and then obtained consent from each participant to facilitate data gathering. The researcher used Free Attitude Interview (FAI) to address the objectives of the study and used this approach for data collection because the discussions between the researcher and participants were of an informal nature (Ayaya et al., 2020).

1.16.1. Fieldwork

The researcher used field notes together with a reflective diary during the research procedure. Field notes comprise explanations of the researcher's reflections concerning the conversations,

interviews, misunderstandings, doubts and stimulation of new ideas throughout the study, (Ayaya et al., 2020). Fields notes comprise a written record of any observations made during the conducted interviews as well as guidance given to participants through discussions, thus enabling the researcher to gain a clear understanding of all participatory engagements

1.16.2 Reflection Diary

According to (Bashan & Holsblat, 2017) a reflection diary is used for research purposes and includes but is not limited to capturing personal thoughts and professional activities to ensure clear information about work patterns. The researcher retained the reflective diary during this study to support the recorded ideas. This process assisted the researcher to reflect on the interview procedure and to make the required modifications where applicable. The researcher also contemplated her personal ability throughout the data collection process and made changes where necessary.

1.17 Data coding and analysis

Wong (2018) explains that data analysis as a process of systematically reviewing and arranging the interview transcripts, observation notes and/or other non-textual materials to increase the researcher's understanding of the phenomenon being investigated. Further Wong (2018), states that the process of analysing qualitative data predominantly involves categorizing and coding the data. Basically, this process involves making sense of large amounts of data by reducing the volume of raw information, followed by identifying significant patterns and, finally, drawing meaning from data and building a logical chain of evidence.

Data analysis in descriptive methodology as espoused in the qualitative research approach is mostly generated through questionnaires and face-to-face interviews. Data for this study was collected using sequentially exploratory strategies. The researcher began this first phase by exploring quantitative data analysis, followed by qualitative data collection. In the second phase, the researcher focused on the findings of the interview questionnaire databank. The purpose of this method was to establish and improve measurement with the sample population (Creswell, 2014). Triangulation was used to interpret the data after it has been captured, analysed and constricted (Creswell, 2014). The data collected though interview questionnaires was coded into various classifications to support the final processing. The researcher studied

the collected data and thereby gained an opportunity to apply evidence acquired from the sample to draw conclusions about the population parameters (Babbie, 2020).

Additionally, data familiarity is critical to the interpretation of the data collected by the researcher. During the data analysis process, the researcher considered all the data collected through interview transcripts, observation notes, the reflective dairy and field-notes. The accumulated data was sorted and coded, after which content analysis was performed through examination and recognition Wong (2018).

Creswell (2014) explained that data collected through interviews, and observation or through secondary sources needs to be analysed for judgements to be made. In this research, thematic analysis will used to analyse the data collected through interviews. It highlights the identification, evaluation, and documenting of patterns or themes within the qualitative data obtained. Nowell et al (2017) argues that thematic analysis is a useful method for probing the perspectives, weigh in on similarities and differences, and produce unexpected insights of the different research participants under study. The below steps are qualified by Nowell et al (2017) to be taken to analyse the data collected and were hence followed by the researcher.

- Researcher studied and familiarised herself with the data collected.
- The researcher arranged and summarised the data systematically to make it easy for reviewing.
- The researcher gathered codes, themes or characteristics were significant using Atlas TI.
- The researcher produced reports, drew up conclusions and interpretations of the reports.

1.18 Triangulation

(Noble & Heale, 2019) defines social science triangulation as the mixing of data types or methods so that diverse standpoints cast light upon a topic. This approach helps to validate the claims that might arise from an initial pilot study. Johnson et al., (2017), the mixing of methodologies with data obtained from both questionnaires and interviews comprises a more profound form of triangulation. The researcher's objective was to triangulate the findings from the interview questionnaires (quantitative-element) and face-to-face interview (qualitative-

element) to validate and verify the findings that will be interpreted, and to make informed interpretations and explanations in the study.

1.19 ETHICAL CONSIDERATIONS

The Helsinki Declaration of 1972 argues that it is vital to obtain clearance from the relevant Ethics Committee when human or animal subjects are part of an empirical study Thus, the researcher had to seek clearance to conduct the study Committee of Publishing Ethics, 2006, 2018) and to abide by the following ethical principles throughout the study:

19.1 Informed Consent and Voluntary Participation

In line with the research procedures, the researcher arranged a meeting with the HODs at the Free State Provincial Treasury, Bloemfontein after receiving approval to conduct research within this organisation. The following actions were then undertaken: the researcher provided a written consent form to all participants before implementing the study and approached the potential participants collectively. Both the purpose of the study and data collection process were explained in detail and the participants were be given a suitable timeframe (a week) to read, understand and decide whether they wished to participate in the study. It was mandatory for the participants to sign the consent form giving approval for participating in the research project before the study began. The participants also gave the researcher permission to record interviews. The participants were informed that their participation was voluntary and that they had the right to withdraw even after the signing of the consent form. The above requirements are stipulated by Siti, Roshaidai, Mohd and Arifin, (2018).

19.2 Protection from Harm

The researcher did not expose the participants to any physical or psychological harm and was truthful and polite during all her interactions with them. In addition, when participants needed clarity on specific issues, professional referrals were arranged (Fleming (2018).

19.3 Confidentiality and Anonymity

The researcher and participants had a clear understanding concerning the confidentiality required in research undertakings (Siti, Roshaidai, Mohd & Arifin, 2018). Information shared by participants during data collection, and other information gleaned from both the analysed data and results were kept private to ensure confidentiality and anonymity. The participants did

not write their names on any form and the use of pseudonyms was considered. The interview environment was secured from noise and eavesdropping, and the audio recordings and data analyses were destroyed after the study was completed, (Fleming,2018).

1.20 CHAPTER SEQUENCE

The following Chapter sequence was adopted:

1.20.1 Chapter 1: Introduction

This chapter covers the overview of the study and that include the introduction aim and rational of the study plus the problem statement, research objectives and questions and the significance, of, the study.

1.20.2 Chapter 2: Literature Review

This chapter outlines the theoretical context, providing literature regarding information in transforming internal auditing as well as the use of blockchain technology (BT) in the public sector.

1.20.3 Chapter 3: Research Methodology

This chapter details the research methodology, designs and procedures to be applied in the study.

1.20.4 Chapter 4: Presentation and interpretation of Research Results

This chapter presents and interprets the findings of the data collected from the participants.

1.20.5 Chapter 5: Conclusion, and Recommendations

A summary of the research findings, plus the conclusion drawn from the study and recommendations for further research are all covered in this chapter.

1.21 LIMITATIONS

One of the limitations of this study is the dearth of previous literature or studies upon this topic within the South African context. Another limitation is the fact that the study only focused on

the conditions prevalent at the Free State Provincial Treasury in Bloemfontein and, thus, the findings of the study cannot be generalised.

Furthermore, data collected was based entirely on the researcher's personal report, however, it is expected and trusted that the participants were reliable and truthful when answering the questionnaires.

The researcher needed access to the IAA system of the Free State Provincial Treasury in order to gain insight about this process. Unfortunately, there were challenges regarding free participation engagement as espoused by the PAR and, consequently, participation was denied.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The previous chapter discussed the research problem statement objectives questions aim rational of the study and the methodology employed by the researcher. This chapter reviews the existing theoretical literature regarding BT, and how BT may contribute to the organizational IAA. The focus of this study is to enhance internal auditing skills and knowledge about BT and mitigate the challenges encountered. Lastly the chapter present theoretical perspective on key concepts, and review theories adopted in the study.

2.2 Definition of Key Concepts

The key concepts in this study are internal auditing, accountancy, critical theory, Blockchain technology, public sector accountability, transparency and audit independence.

2.2.1 Internal Auditing

The term ‘audit’ originates from the Latin word ‘audire’ meaning ‘to hear’. For many years, internal auditing was linked solely to accounting and financial statements which are the daily transactions of an organization (Nteziryayo, 2014). Auditing is a self-governing inspection of subsidiaries of transactions of the organisation’s income and expenses, with an opinion of expression on whether such transactions are recorded accurately according to the regulations and policies of the organisation and if these financial reports state only the truth worth and fair value of the organisation at the given date, (Hazaea et al., 2021), In addition auditing is concerned with the “verification of accounting data and determining [the] accuracy and reliability of the accounting statements and reports”. Auditing can be understood as an examination of the books of account or accounting records with a view to establishing whether they correctly and completely reflect the transactions. This process also expresses an opinion on the character of the statement of accounts prepared from the accounting records so examined, as to whether or not they portray a true and a fair picture (Bubilek, 2017; Dicksee, 2016). An internal audit is an independent objective assurance and consulting activity designed to add value and improve the organization’s operations. It assists an organization to accomplish its objectives by employing a systematic disciplined approach to evaluate and improve the

effectiveness of risk management, control and governance processes (Coetzee, du Bruyn, Fourie & Plant, 2014).

Similarly, Tumwebaze, Mukyala, Ssekiziyivu, Tirisa and Tumwebonire (2018) expalins internal auditing as a review of financial statements, records and corporate transactions that the internal auditor examines from a professional perspective to decide whether the financial reports are a true reflection of the organisation's affairs. The internal auditors are the pillars at the centre of the organisations because they strive to achieve the company's goals and effectively to improve its operations. The researcher employed the Critical Theory (a social theory) in this study which leans towards reviewing and changing society, with the intention of uncovering assumptions about social life and how humans understand how the world works and strives to empower human beings (Bohman & James, 2021; Crossman, 2019). The IAs need to be empowered through knowledge and exposure to new technology, thus this study will also look at theoretical empowerment strategies aimed at increasing individual's knowledge when undertaking assigned tasks (Singh Dubey & Tiwari, 2020).

2.2.2 Blockchain Technology

Morrison (2016) defines BT as the technology underlying Bitcoin and other crypto currencies, involving a shared electronic ledger that is continuously updated in respect of data listing of all transactions. Swan (2015) describes BT as an open access ledger and as a growing mechanism through which 'miners' add recent blocks to record recently occurring Bitcoin transactions. According to Abreu, Aparicio and Costa (2018) blockchain is a growing network that records transactions that are secured via cryptography, each transaction contains a hash pointer as a link to the previous transaction data that was executed at that time. Blockchain is not accessible to modify data, but it functions as a distributed ledger that accurately and permanently records transactions executed among two or more people. According to Coindest (2015), blockchain is a database of transactions distributed to different nodes or networks, and the system is joined to keep the structure of encrypted 'bits' chained together as a unit.

2.2.3 Public Sector Accountability

The use of BT in the public sector would involve governments and all publicly controlled or funded agencies, enterprises and other entities that deliver public programmes, goods or services (Institute of Internal Auditors Global, 2011). The introduction of BT into the public

sector will create a new ecosystem that will allow the government and citizens to join forces in producing citizen-centric services (Othman, Razali & Nasrudin, 2020). Within the public sector IAA is mostly an independent function that consists mainly of monitoring transactions' correctness, pre-payment verification, control asset counting and reporting on previous occurrences to various types of management. Importantly, the use of BT in the public sector will enhance the value the IA brings into the organisation. However, in recent years, a confluence of factors has resulted in a quiet revolution in this particular profession. BT will demonstrate transparency and accountability in governments, especially in terms of the use of public funds as well as in attaining efficiency in service delivery (Chedrawi & Howayeck, 2018; Nteziryayo, 2014).

2.2.4 Transparency

BT safeguards transactions by storing information in such a way that it cannot be modified. The record of transactions is visible to anyone; therefore, BT makes records of all transactions available, thus it is "impossible to hide transactions and [is] relatively easy for third parties to track data entries and keep blockchain honest (The Blueprint for Blockchain and Social Innovation, 2019). BT creates transparent and secures auditable trails (European Parliament, 2018) and such transparency builds trust and promotes efficient verifiable transactions (Kshetri, 2017).

2.2.5 Accountability,

According to Tumwebaze, et al., (2018) refers to being held responsible for past events resulting from decisions made in the interest of the organisation. BT seeks to "foster cooperation with and accountability of global institutions via mechanisms which reintroduce transparency and traceability into human governance". A lack of accountability has caused many organisations to suffer a financial loss (Seeburn, 2017). Experts have mentioned that BT ensure accountability, BT emphasises accountability, transparency, and distribution of data. Service transparency and accountability, boosted by computerization and the spread of cyberspace, can be implemented through BT's frameworks (Herian, 2018).

2.3 Traditional Internal Audit Activity Processes

IAA processes are a long-standing practical work instrument in various organisations (IPPF, 2017; IIA SA **(**The Institute of Internal Auditors, South Africa**),** 2017). IAA is an independent,

objective assertion and counselling activity designed to advance a company's operations and achieve its objectives (IIA, 2017; Ståhlbröst & Lassinantti, 2015). The IAA framework is traditionally used to evaluate and make improvements in terms of risk management, internal controls environment and governance processes by providing a precise understanding of organisational proposals (Dzikrullah, Harymawan & Ratri, 2020). The latter process is based on the risks found through commerce procedures, examinations and evaluations (Dzikrullah, et al., 2020) resulting from IAs' commitment to keenness, responsibility and accuracy. IAA gives esteem to the administration of the organisation as an autonomous and objective source of recommendation (Bubilek, 2017). Furthermore, IAA performs an internal review based on the scope of the organisation that includes risk management, internal control, organisational administration, safeguarding resources as well financial reporting that complies with policy and guideline procedures (Brata & Arnan, 2021). IAA may include conducting proactive fraud reviews to recognise possible false. Post-inspection is conducted to recognize control failures and recover financial loss. IAs support the organisation's activities by providing suggestions to Board of Directors on how improve the execution of their duties (Mensah, Kumi-Kyereme & Aikins, 2021). Essentially, the organisation's controls improve because IAA is an efficient framework control apparatus for conceivable changes to future goals and approaches. Manasseh, (2000 as cited by Nteziryayo, 2014) states that IAA guarantees that:

- Present internal controls are satisfactory and successful.
- Financial reports provide the instant outcome of real accurate operations.
- Each division in the organization abides by the courses of activity and procedures laid down by top management.

The IAA tests the accessible controls developed by the organization's board, senior management, essential workforce and partners (Werner, Wiese & Maas, 2021; Kagermann, Kinney, Kuting & Weber, 2001) in order to supply sensible affirmation that the organisation is fulfilling its objectives within the following items:

- Reliability of yearly money related articulation report.
- Operational capacities viably and efficiently.
- Conformance with accessible directions and laws.

The above reality demonstrates the significance of the IAA processes within organisations, and it is mandatory for them to have their annual reports reviewed by an independent qualified evaluator.

2.3.1 Two Types of Internal Audit Services

The following service genres are explained below:

2.3.1.1 Assurance Service

Assurance Service is an objective assessment and gathered evidence by IAs to provide conclusions and recommendations regarding the organisation (Bible, Raphael, Riviello, Taylor & Valiente, 2017; Standard, 2017). This service includes operations, processes relating to the functioning of the organisation and the nature and the scope of assurance engagement (Dzikrullah, et al. 2020; Flowerday, Blundell & Von Solms, 2006). The aforementioned services are planned by internal auditors with the three involved stakeholders who are:

- The client that is directly involved in the company ─ process owner.
- The person making assessments ─ IAs and
- The person using the assessment ─ user.

2.3.1.2 Consulting Services

According to IIA Standard (2017), an advisory action is performed when requested by an engagement client (i.e., an organisation with whom the internal auditor is working). This process is denoted by the nature and the scope of the consulting engagement performed beneath the assertion with engagement client. There are two members included in this process namely:

- The individual offering the benefit ─ internal auditing, and
- The individual seeking and receiving the advice ─ engagement client.

When performing consulting engagements, IAs ought to comply with the code of ethics and benchmarks, be objective and not acknowledge obligations of governance without proof (Mensah, et al. 2021).

2.3.2.1 Internal Audit Activity Role in the organisation

2.3.2.1.1 Governance

Board of directors refed to as Governance, a structure the rapidly comprehends, facilitates, directs and refines the work of an organisation to assist it to achieve its goals (Tumwebaze, et al. 2018), . The organisational framework reinforces the ethics and values, performance, and obligations of the organisation as well as the communication of risks and controls, internal operations, and information development techniques. Abreu, Aparicio, and Costa, (2018).

2.3.2.1.2 Risk Management

This process examines threats that may affect the organisation's mission and goals (Dubihlela & Nqala, 2017, Ma, et al. 2020). This treatment combines the understanding of an organisation's risks desire, threats testing and centralisation of threats that evolve as they apply, achieving the mission and goals of the organisation. In addition, it provides an opportunity for the organisation to incorporate an assessment of the types of threats involved in the inspection and communication of risks (COSO, 2018)**.**

2.3.2.1.3 Internal Controls

According to Brata and Arnan (2021), internal controls help to mitigate risks and, thus, ensure the success of the organisation's goals through the creation of efficient and rich operations, strong financial statistics and compliance with laws and guidelines (Schandl & Foster, 2019a). Moreover, internal controls provide objective and independent overviews of the depth and completeness of the organisational control framework as established by the organisation which examine and evaluate the adequacy and rationality of organisational operations, risk management and internal controls (Rückeshäuser, 2017a).

2.4 Traditional Financial Transactions and Corporate Reporting

According to Abreu, et al. (2018), IA tests a reasonable sample of accounting entries through physical documentation and computer reports to ascertain accuracy in order to verify the information with trading partners and, in some instances, by speaking with various employees to explore the possible existence of unusual or unethical accounting practices (Westra, 2016). According to Tumwebaze, et al. (2018), once an organisation frames IAA, it completes the risk evaluation process and creates an internal review to orchestrate the appropriate individual risk evaluation. Lemieux (2019) states that it is essential to build a viable strategy and follow-up on review outcomes and activities approved by the governance. The completion of this process may incorporate recording all the discoveries in a database, planning a follow-up and asking

for status from the auditee (Markey-Towler, 2018). This activity may incorporate handling the administration of the reviewed zone report to senior administration and the review committee. Additionally, IAs ought to decide the degree to which the determination of reviewing discoveries must be approved independently (Jachi, 2019). There is no 'one-size-fits-all' approach to the execution and completion of the internal review engagement. IAs' authority, governance and review committees need collaboration in order to achieve success for the organisation (Ahmed, 2016).

However, when using BT, external confirmation will not be required since blockchain records are settled and time stamped (Piscini, 2016). The BT analysis will be speedier and more straightforward for controllers and, subsequently, will make strides in availability. Willis, (2017) agree that inspection of income and expenses will be conducted "in literally a split second because the companies are capturing, signing and agreeing all the data at the time of [the] transaction". According to Deloitte (2017), BT requires the IA to follow specific accountancy steps, which serve as an additional safeguarding of data, and the company may directly write its transactions into a shared register to establish interconnections between data (Bheemaiah, 2017). Notably, companies could benefit from BT which will automatically allowing IAs to verify facts about the organisation's financial statements, timeframes and costs, thereby significantly reducing the scope for performing audit engagements. IAs will have sufficient time to add more value to complex transactions and internal control mechanisms.

2.5 Big Data Analysis and Internal Audit Activity

Big data refers to a huge volume of information that conventional programming or computational frameworks cannot process or investigate. Enormous information might incorporate organised, semi-organised, or unstructured information. Notwithstanding enormous volumes of information, huge information envelops the speed, esteem, heterogeneity, quality, and assortment of the information (Hassan & Chan, 2021). Nowadays, information analytics have drastically influenced the way organisations assess and compile vital information, by considering key threats (Ghasemaghaei, 2020; Kodapanakkal, Brandt, Kogler &van Beest, 2020). This process has extended the procedures that IAs can apply when executing audits, subsequently giving a much better, higher, stronger an improved level of assertion (Baev Levina, Reut, Svidler, Kharitonov & Grigor'ev, 2020). The routine survey approach on big data is designed to recognise control targets, assess control places and test big data as well as the degree of control working ampleness (Abreu, et al. 2018a). It is recorded

that advanced techniques apply repeatable and viable data analytics and make an advanced comprehensive and risk-based approach (Kostic & Tang, 2017). Through data analytics, organisations could productively audit the complete public exchanges and not only fair tests, hence, permitting conclusions based on the aggregate of exchanges. This practice empowers IAs to recognise proof of an issue's root cause and the progress of recommendations (Abreu, et al. 2018a). IAs ought to collaborate within their organisation to create and execute a cohesive procedure to use big data analytics for the organisation's benefit (Ghasemaghaei, 2020).

According to ZhangYuan, Nandakumar, Chopra, Sim and De Caro (2019a) enabling real-time, nonstop information monitoring increases the general proficiency of the reviews being performed (recurrence, scope, etc.). Jabbar and Dani (2020) state that taking a "deeper dive" into key risk regions through information investigation reduces costs relating to inspecting and observing to ensure early location of potential fraud and blunders are examples of how IAs can add value to their organisations. Information analytics-enabled review programs assist IAs to make computerised information extractions, changes and loading of (ETL) forms, thereby supporting the advancement of system-generated analytics' apparatus and dashboards in arranging to screen trade behaviour against risks' criteria (Mirabelli & Solina, 2020). In addition, these specific review programs are scheduled to compile discoveries, confirm the basic root cause of risks and determine remediation activities to assist in arranging the trade and relieve risks successfully (Brender & Gauthier, 2018). They also assist with the use of mechanised reviewing devices that recognise business inconsistencies and key risks pointers that may trigger a sound understanding of the organisation's information governance framework (capacity, security, utilisation, IT applications and foundation) (Baev, et al. 2020). Essentially, reasonable information helps to inspect database designs and capability to provide the fundamental dataflow expertise in consolidating information analytics into a review technique, and to adjust this process to the risks and assurance scope, in line with the expertise within the execution and utilisation of information analytics' tools and software (Abreu et al. 2018a).

2.6 Integrated Enterprise Risk Management (ERM), Monitoring and Internal Audit.

Risk assessment is conducted yearly by the IA in order to set up an organisation's risk appetite, and arrange for the coming years (Kostic & Tang, 2017).This process, however, often neglects other risk monitoring capacities that conduct evaluations throughout the organisation, and are striving to enlist an advancing corporate chance (Ade, Joseph & Dansu, 2020). Even though a

persistent risk assessment preparation may display challenges, such as quality of data and data accessibility, it creates the opportunity to essentially raise the IAs' esteem in terms of governance, risk management and internal controls of the organisation (Anon, 2019; Schandl & Foster, 2019b)**.** Furthermore, IAs may assist in risk management and coordinate with the organisation-wide risk assessment procedure to encourage the reliable utilisation of common risk dialect and understanding of organisational key risks (Sprčić, Kožul & Pecina, 2015). They may also assist in assessing the organisation's risk evaluation forms related to major vital activities and evaluate the existing setup, pilot nonstop risks appraisals for sub-groups of risks to illustrate benefits and oversee such change-related activities to various risk management systems such as COSO. Coordinates System, Endeavor Hazard Administration (ERM) and ISO 31000 (da Silva Etges, Grenon, de Souza, Kliemann Neto & Felix, 2018). IAA requires that risk appetite should be acceptable and effective risk management processes should be in place to ensure independent evaluations of venture risk management systems, including reviewing risk management frameworks (Renault, et al. 2016). IAs should also possess the ability to survey whether key risks are being successfully overseen by the organisation through the usage and execution of moderating controls and pre-arranged risk assessment exercises throughout the whole organisation (Ojeka, et al. 2019).

2.7 Public Sector

The SA government chose to actualise the corporate organisation guidelines/prerequisites for the open division set out in the King Report (IOD 1994) and created a regulatory environment for adoption. The Public Finance Management Act (PFMA) was pronounced in 1999 and, in terms of a state requirement (Office of Open Enterprises 2002 – SA) the records of government departments and enterprise organisations are inspected by IAA (Municipal Finance Management Act (MFMA) (SA – No 56 of 2003).

2.7.1 Public Finance and Management Act and Treasury Regulations

Treasury regulations were issued in relation to PFMA (SA- 1999: S76(e); SA- PFMA 1999: S338(1); SA-National Treasury 2005:3.2) that government departments should have an IAA process in operation. Audit Committees should work hand-in-hand with the IAs and review internal audit reports regarding the organisation and upgrading the opportunity for attaining the IIA definition and benchmarks as prerequisites for performing internal engagement reviews and point by point commitments and assignments of the work. A point related this requirement

includes a risk assessment that must be performed by the organisation on a standard risk organisation strategy and based on the risk assessment, which must be aligned with what IIA needs (Fourie, 2014). Treasury Controls for divisions, exchanging substances, protecting education, and public substances (from now on alluded to as Treasury Directions) have been issued in terms of segment 76 of the PFMA (National Treasury, 2005; RSA 1999).

Treasury Directions 3.2.5 and 3.2.6 (National Treasury, 2005) stipulate that the organisation and administration of a public segment IAA must be conducted in line with the established IIA definition of IA, and internal review engagements must be conducted in terms of the IIA standards. In addition, the public sector's commercial administration held substances that clarify the provisions of PFMA in spite of the fact that Treasury Regulations combine the credibility of the department in sharing IAA capabilities (Coetzee,2010; SA-Department of Public Enterprise: 2002). The records incorporate IAA implementors as full-time agents of the organisation by looking at the opportunities and credibility of subcontracting and co-sourcing agents.

2.8 Types of Blockchain Technology

BT may be a conveyed record (database) with a particular information structure and no central framework organisation or server that administers it (Psaila, 2017; Scott, et al. 2017). Companies or any person can create Bud Chain (BC) systems by utilising the uncommon programs and conveying correct duplicates of the BC (which are called nodes) from a specialised point of view. Heiskanen (2017) states that the entity "block" is a record of data that holds recognisable information and the 'put-away' substances, whereas "hashes", a vital portion of the distinguishing information, are the block's interesting unique mark (Chedrawi & Howayeck, 2018).

2.8.1 Public Blockchain

Blockchain is an easily accessible open agreement grounded on proof of work (PoW) that anyone can access without authorization. Voshmgir, (2019) states that codes may be downloaded, and anyone can start an exchange, examine and/or approve transactions within the network, pieces are added to the chain within their current state

2.8.2 Federated Blockchains or Consortium Blockchains

An unified Blockchain according to Voshmgir (2019) works underneath the ‘pro of a bunch’ and in contrast to Open Blockchains, they do not permit any individual to access information or make transactions. Moreover, Bound Blockchains are speedier (with higher adaptability) and give greater trade assurance – these Blockchains comprise the first parcel utilised interior in the keeping-cash division (Thomason, Bernhardt, Kansara & Cooper.2019). The centre diagram is pre-selected and controlled to be always ready, and one might foresee a consortium of 15 money-related instructions within the operation centre. For the piece to be significant, 10 members should sign each instruction by arranging for it to be correctly Blockchain compelled by its members.

2.8.3 Private Blockchains.

The organisation’s records are centralised, (Voshmgir, 2019), the applications are hidden not every individual has access to the blocks. Private Blockchain is advantageous in blockchain advancement and setting bunches and affirming trades internally Voshmgir, (2019). It also allows security breaches such as the centralised system preoccupation notion, and secure invalid blockchain (van de Luijtgaarden, 2017; Zhang et al. 2019b).

2.8.4 Hybrid/Blockchainified

Voshmgir (2019) states that the technique of open Blockchains is presently facing flexibility difficulties and recommends that only a handful of trades per minute can be handled by this network and that it is impractical and unachievable to attempt a tremendous scale of applications per a high volume of exchanges. Sims, Zhao and Sun (2018) believe that because Bitcoin and Ethereum can take care of less than a dozen trades per minute, while Visa alone would require at least 100 thousand trades per minute. Voshmgir (2019) outlines the benefits of the Big Chain (BC) database, therefore, stating that it offers flexibility control – a distributed database with unchanging components of Blockchains – to solve this issue on the database (Sun, et al. 2020). The BC database is a vital innovation within the numerous dispersed calculations and measures relating to the question of adaptability (Mohanty, 2018). Currently, updating information structures for Web3 and moving to a decentralized and distributed computing web from a centralised computing system is essential. Therefore, the BC database exists as a vital component within the Web3 and functions as an imperative component within the Web3 innovation load. In line with submissions made by Coenen, De Prest and Leyssens (2017), the majority of exchanges are accessible to each network where lines cross within the

Bitcoin range and are recorded in a public ledger after confirmation. Also, each exchange that has happened ought to be confirmed for validity and currently it is recorded within the open record, thus confirming organisational frameworks that must guarantee recently recorded exchange.

2.9 Blockchain Technology used in Bitcoin.

The Economist, (2015), CommerceBlock Token price (CBT) checks the open record to ensure sufficient Bitcoin is in the wallet. If there is ample Bitcoin, special centres called ‘miners’ will combine the offer with other trusted exchanges and further create a modern piece for blockchain (The Financial Specialist, 2015). Furthermore, pieces are cryptographically ‘hashed’ and used as input that changes over time into a fixed-size alphanumeric string, which is called the ‘hash esteem’ (also called a message process, an advanced unique finger impression, a process or a checksum) (Brender & Gauthier, 2018). The hash esteem is utilised, together with other information, into the header of the proposed square of exchange. The header at that point becomes the premise of PoW performed in the Bitcoin system, (Rückeshäuser, 2017b). In addition, the mineworker hub tackles the verification of the work, while other hubs check it and, after that, each hub affirms the arrangement and hash upgrades the blockchain head of the intended piece, (Swan, 2015). The block results are an unused and recognising sequence that shapes a portion of the disseminated record within the blockchain. Wallet A’s instalment, as well as Wallet B’s exchange and all the transactions that were executed within the piece are confirmed, (Janssen, Weerakkody, Ismagilova, Sivarajah & Irani, 2020)

Bible, et al. (2017) assert that blockchain innovation is freely accessible and the innovation comprises three parts which are:

- recording of transactions.
- verification and validity of transactions; and
- updating public ledger and verifying transactions.

Masterson (2017) confirms that during the engagement method of conducting an inspection of an organisation’s records, backup-books and other significant archives employed in arranging and/or deciding whether the money related explanations are reasonable and genuinely state the company’ undertakings which are based on a set of regulations that rules the Universal Bookkeeping Guidelines, or Generally Accepted Accounting Principles (GAAP) (the

acknowledged guidelines for bookkeeping standards). According to Huber (2016) blockchain, records permit anyone to contribute information and share records with everybody who has a recognisable duplicate of the record. Overall, BT provides reasonable assurance which improves efficiency in IAA (Kostic & Tang, 2017).

2.10 Blockchain Technology used to enhance Internal Audit Activity

COSO (2020) discusses how BT can be used as an internal control with an appropriate and well-designed policy. Similarly, BT assists in upgrading organisational internal controls by advancing responsibility, assuring record astuteness and being undeniable. Zhang, et al. (2019) maintain that appropriately actualised BT may decrease concern over coordinating access to the records and altering or erasing chronicled information, while Crosby, Pattanayak, Verma and Kalyanaraman (2016) assert that BT plays a role in safeguarding entries and protecting historical records, BT is an open straightforward record disseminated with the exchange of records and databases with open access to the system without an individual's control**.** Bible, et al. (2017) avert that BT is an intuitive spreadsheet that has access to records in the block and affirms the occurrence and accuracy thereof. Brender and Gauthier (2018) believe that BT has total data around addresses and equalisations from all the primary transactions executed to the latest completed deal. It is an open record which implies that it is simple to make an inquiry regarding any 'piece-pilgrim' for transactions associated with a specific Bitcoin address (Swan, 2015).

BT is the latest mechanical development of Bitcoin since it stands as a 'trustless' confirmation component of all the transacted exchanges (Distributed Ledger Technologies for Public Good: leadership, collaboration and innovation, 2016). Clients can access the framework of the open record distributed around the world on numerous distinctive decentralised shared systems kept by miner accountants with the exchange counterparty (another individual) or a third-party mediator (such as a bank). Lemieux (2016) states that BT is a framework comprising decentralised 'trustless' exchanges as its key development. Swan (2015) affirms that BT is an application layer that runs on the existing stack of Web conventions and exchanges, including a totally unused level to the Web to empower financial exchanges, comprising quickly advanced money instalments in an all-around usable cryptocurrency for both longer-term and more complicated money related contracts.

Ojo and Adebayo (2017a) assert that any cash, budgetary contract, or difficult or delicate resource may be executed with a framework. Moreover, BT may not be solely used for exchanges, but also as a register of assets and a structure for keeping records, as well as checking, executing and protecting resources. Ståhlbröst and Lassinantti (2015) aver that BT is a database that enlists all assets and other accounting records within a structured platform that is used to consolidate all the assets held by parties around the world. It includes counting physical property and intangible resources (votes, ideas, notoriety, purposeful and wellbeing information) (Swan, 2015). The upgrade of internal control activities through smart contract may be used as an instrument of executing a legally binding contract. If well controlled, BT may limit the risk of and human error and/or people committing fraud because the system uses real-time to record it transactions.

2.10.1 Applications of Blockchain Technology in Two types of Internal Controls

2.10.1.1 Preventive Controls.

This control is a fundamental blockchain mechanism that provides top quality and accurate records based on real-time. (Rspe, Ive, Burns, Steele, Cohen, Ramamoorti, Burns & Cohen, 2020 a)

2.10.1.2 Detective Controls.

Permeability exchanges in blockchain mechanism give unused roads for detective controls when the fundamental data is accessible to discover both on-chain and off-chain data (Rspe et al., 2020a). Furthermore, since essential information is accessible, blockchain is attached with explanatory capacities of more rising innovations – such as IA, IoT, and data analytics; and these may be used for identifying peculiarities (Kloch & Little, 2019) . The issues that may arise in Blockchain mechanism is largely premised on what the issues are, and how to address them, even when rectifications are still conceivable (Baev et al., 2020). Provided blockchain mechanism adds only adjustments to be reflected as alterations instead of redresses on a current exchange, this blockchain mechanism depends on the specific blockchain that is used (Edward, 2019).

this control involves permeability exchanges in blockchain mechanism that provide unused roads for detective controls when the fundamental data is accessible in order to discover both on-chain and off-chain data (Rspe, et al., 2020a). Furthermore, since essential information is

accessible, blockchain is attached with explanatory capacities of future arising innovations (such as IA, IoT and data analytics) and these concepts may be used for identifying peculiarities (Zhang et al., 2019b). The issues that may arise in Blockchain mechanism is largely premised on what the issues are, and how to address them, even when rectifications are still conceivable (Baev, et al., 2020). When the blockchain mechanism only adds adjustments that will be reflected as alterations instead of redresses on a current exchange, this device depends on the specific blockchain being used (Edward, 2019).

2.11 Blockchain technology related to the Five Components of Internal Auditing

According to the article 'Evaluating blockchain and internal control through a COSO focal point' published in the Journal of Accountancy (2020), Blockchain innovation may provide great progress in risk management governance, as well to improve the internal controls of the organisations. Blockchain and Internal Control from a COSO point of view portray employments for the COSO (Internal Control – Coordinates System, 2013) and for assessing risks and for the utilisation of blockchain within the setting of monetary related-issue and to plan and actualise internal controls to address such risks and over ICFR in a blockchain environment. Burns, Steele, Cohen and Ramamoorti (2020) say there should be suggestions on five (5) elements of IA system if BT is presented into the business environment.

According to the article 'Evaluating blockchain and internal control through a COSO lens' (2020), BT enhances internal controls to their full capacity to advance effectiveness, proficiency and adequacy that may, in turn, lead to solid quality and awareness of budgetary and other progress details, while complying to regulations and controls. Paul Sobel, Chairman of COSO, have reiterated in news reports 2018 that when BT is used through a COSO focal point, and assessed by an organisation, it empowers the board of executives and senior administrators to see the potential in BT and to acquire relevant knowledge and skills. Mohamad, et al. (2020) affirm that IA should be included within the initial stage of blockchain preparation. BT is much less demanding as well construct satisfactory to governance, risks management and internal controls when it is incorporated during the beginning phase and can be modified if and when an issue emerges.

Chen et al., (2019) stress that IA ought to acquire skills and capacities to understand the fundamentals necessary for improvement, especially in relation to resolving continuing challenges facing the organisation. Ståhlbröst and Lassinantti (2015) and Uddin, Stranieri,

Gondal and Balasubramanian (2021) maintain that once the blockchain has been dispatched, analysts also need to verify that reasonable mechanised checks are also entered to ensure favourable transactions are executed correctly in order for the organisation to implement successful recovery strategies after the occurrence of disasters, which may be in form of the encryption of key incidents, and thus mitigate loss (Kloch & Little, n.d.). IAs may in fact be needed in the long term in terms of asserting blockchain traditions with three-entry accounting, and asserting blockchain record segments versus existing double-entry accounting records (Rspe et al., 2020a.). The financial statement verifications of completeness, presence, rights and liabilities, introduction of disclosure and accuracy and valuation will continue to apply the IAA approach to confirm these links.

Figure 1 :COSO framework ***(SOURCE: COSO, 2018)***

2.11.1 Five Components of Internal Auditing:

The major components of Internal Auditing are explained below:

2.11.1.1 Control Environment.

BT is an instrument that encourages an effective control environment with features that record data with minimal human mediation (Rückeshäuser, 2017b). This component basically deals with human behaviour, such as governance advancing astuteness and morals (van de Luijtgaarden, 2017). BT cannot evaluate the ethics of a control environment because this concept deals primarily with human behaviour which BT cannot access.

2.11.1.2 Risk Assessment.

BT moderates both internal and external extant risks, by advancing responsibility, up-dating records and providing irrefutable data (Rspe et al., 2020a.), individuals cannot challenge the system because every transaction is recorded in the chain. (Burns, et al., 2020) and BT uses an internal control that may mitigates identified risks.

2.11.1.3 Control Activities.

BT assists and encourages control activities (Burns, et al., 2020). BT and Smart contracts are effective for implementing successful and productive worldwide commercial exchanges that limit personnel blunders along with opportunities for extortion (Dubihlela & Nqala, 2017). BT also oversees and detects barriers before they are implemented, although the collective perspectives of BT can present extra complexity, especially because the network is an uncontrolled and decentralised system with no one accepting responsibility in terms of how the system falls under the Internal Control over Financial Reporting (ICFR) framework (Rspe, et al., 2020a.)

2.11.1.4 Information and Communication,

The attributes of BT improve the permeability of exchanges, and the accessibility of information, thus, making unused roads for governance to communicate monetary data to key partners quickly and viably (Burns, et al., 2020). One reason for management to consider BT application is that it grants accessibility to data and backs-up all money related data, thus assuring the reasonableness of data executed in BT. With management communication, BT demonstrates the importance of control activity (Schandl & Foster, 2019a).

2.11.1.5 Monitoring Activities.

BT guarantees more frequent observation of more subjects, (Rspe, et al., 2020a). The utilisation of shrewd contracts and standardised commerce regulations, in conjunction with IoT observation, may change how financial procedures are performed (Schandl & Foster, 2019a).

2.12 Traditional methodologies of Internal Audit Activity Engagement Processes

According to Tumwebaze et al. (2018), once an organisation instigate an IAA framework, they prepare risk assessment and execute internal audit engagements that are responsive to the risk

assessment and actions to be taken after the assessment and, thereafter, confirm the review task, scope, timing and reason for the process to be examined. In a few cases, it may be appropriate not to declare the review in advance but to execute the review spontaneously (Markey-Towler, 2018; Lemieux, 2019). Anon (2013) explains the process used to perform the internal audit engagement, and this process highlights the establishment of an appropriate plan for the review engagement that incorporates the following tasks:

- Evaluate the risks of a particular area to be reviewed.
- Develop a composed work programme.
- Agree on the scope area, test measure and period under view.
- Develop a report effectively.
- Request and obtain certain development data from the zone to be reviewed.
- Access working data, execution degree, etc., on the area to be reviewed.
- Review any earlier reviews of this region by inner review or other parties, such as controllers, outside reviewers and consultants.
- Hold joint arranging dialogue with administration personnel and prepare proprietors of the area to be investigated to memorise their area of intrigue and concerns.
- Consider whether self-assessment exercises would be helpful.
- Gather external data on the best practices.
- Implement benchmarking.
- Identify the inner review assets to be relegated to the review to guarantee these have a suitable level of encounter and competency.
- Decide on the off chance whether exterior assets or visitor inspection ought to be utilised for counting data resources.

In addition, it is important to consider formal entrance closing discussions (Klochkov, Klochkova, Solopova, Kuzmin & Kikkas, 2018).

Furthermore, the evaluation process is to execute a realistic internal audit strategy, including an assessment handle and control plan, as well as testing strategies to decide control-operating adequacies, such as to request and conduct observation, examination and re-performance (Mensah, et al., 2021). Similarly, this process involves discussing potential discoveries with governance and preparing the proprietor for the consulting engagement, perform agreed-upon engagement steps to meet the task objectives (Kalabeke, Sadiq & Keong, 2019). Developing a

report or other suitable communication strategies responsive to review engagement with completed findings may entail any of the aspects listed below.

- Executive outline of major issues and findings.
- Background, objective and scope.
- Audit findings, counting management's activity, arranging for attending to these findings.
- Other investigations and data, counting appendices.

2.13 Blockchain Technology Internal Audit Activity Engagement Processes

According to statements made by to Zhang, et al., 2019a (2015), BT is a decentralised transparent ledger with the exchanges of records and database with its interfacing point being a few lines that come together and are shared by all arranged clients, upgraded by diggers, observed by everybody, but claimed and controlled by no one. Wang et al. (2019) assert that BT is an intuitive spreadsheet that everybody can upgrade and further affirm that the stored advanced exchanges are drastically distinctive. Vew (2017) avers that BT has total data around addresses and equalisations from the primary transactions initially executed to the foremost of the last completed piece. Brender and Gauthier (2018) see BT as an open record which implies that it is simple to review any square pilgrim for transactions associated with a specific Bitcoin address. Berryhill, Bourgery and Hanson (2019) maintain that the IAA will be able to access the wallet address to see the exchange which begins with Bitcoin. As stated previous, Lemieux (2016) argues that blockchain is the most mechanical advancement of Bitcoin since it stands as a "trustless" confirmation instrument of all the exchanges established. Furthermore, it means that BT is a decentralised framework, and "trustless" exchanges are the key development it permits with no association and decentralisation of all exchanges between all parties on a worldwide premise.

Every valid transaction process adds to a log of blocks of confirmable logs and generates nodes to operate and structure the procedure for records and log access on the hash chain. Furthermore, alphanumeric documents involve the threading of 1"s and 0"s, therefore, a hash process computerises any data and casts calculations on it to ensure a solid length is developed when a whole length is altered (Brender & Gauthier, 2018). In addition, the arithmetic calculations behind the hash process assures there is no real route to deduce the electronic settings from hash processes that contain full capacity (Zhang, et al., 2019a). While blockchain

miners also add blockchain documents and monitor any shortcoming that contributes to hash, the Merkle tree more efficiency preserves date integrity for blocks of data that individually contain various transactions. Every transaction is accepted over the hash function and sets of hash functions are accepted again over the identical hash function, (Zhang, et al., 2019a), from which the last two (2) hashes are accepted to accomplish the root hash.

Therefore, creating the Merkle tree allows detection of any alterations to the data by "simply re-running the hash function" (Lemieux, 2016) because each block is associated with another via a fingerprint and a time stamp. In addition, BT can be used to address issues related to information integrity in the present and the near future, assuming proper security design and infrastructure management controls are in place, and, thus, guarantees reliability of information and provides a long-term solution for maintaining trustworthy digital records. Cagnazzo (2017) supports the idea that BT advances with minimum regulatory for greater value-adding and efficiency advancement to internal audit activity and accountancy. Smith (2017) explains that the main issue currently challenging IAs is their inability to prove whether blockchain applications are working in accordance with their intended purpose, as is the case with other technology-based innovation and strategy teams that are developing blockchain solutions for the organisations. Unfortunately, the IAs' current dearth of knowledge and skills regarding blockchain hinders their progress in implementing BT (Brender & Gauthier, 2018; Cagnazzo, 2017).

2.14` Challenges Internal Audit Activity Faces

According to Vitso, Joar, Harkestad & Krogh (2017) BT challenges the conventional review engagement because no viable guidelines are given for using point-in-time scientific analysis and standard review tools. Liu & Shen (2020) maintain that assurance in a blockchain environment is obtained from verifiable exchange history and data integrity. Fundamentally, the framework has one hundred percent integrity. However, struggling to perform a point-in-time internal review investigation remains difficult and undermines the benefits of BT, especially the guarantee of expanded authoritative productivity and effectiveness (Smith, 2017). Moreover, many organisations do not have the necessary information nor technological facilities for their IAs to effectively test blockchain-based projects and execute transactions through BT. (Liu & Shen, 2020). However, owing to the ubiquity within the money-related governance industry, it is critical for organisations and IAA implementors to understand BT solutions (Jessica FinTech, 2017).

In addition, conventional budgetary administration firms are feeling the benefits of the improvement of money-related innovation, and the majority (+- 83%) of money-related administration firms accept that a portion of their trade is at risk of being misplaced to FinTech companies. FinTech firms moreover anticipate capturing 33% of the financial trade, and this process may still require blockchain reviews to construct certainty and affirmation within the innovation.

The standard auditing approach will be replaced by a process that is closer to examining exchanges in real-time, and this change will present challenges for the current IAA systems (Smith, 2017). The real-time inspection examines the exchanges accuracy and its occurrence, and there are numerous ways to accomplish this task (Vitso, et al., 2017). To accomplish the above task via BT is a complicated process that requires a moment of basic innovation and tapping into the processing itself, involving arrangement, as well employing the straightforwardness that third parties require for real-time examination and distribution, using the conventional concept of testing. According to Smith (2017), the purpose and reasonableness of testing "is to perform backward-looking assessments of segments of populations to draw conclusions about the rest of the population". Nevertheless, Vitso, et al. (2017) aver that BT provides modern assurance criteria that distribute the requirements of blockchain record inspection, and is an up-to-date unchanged authentic record, because auditing within the blockchain environment requires a distinctive knowledge and skills approach which many IAA systems will still have to comply with. Blockchain record inspection involves regulations that come with the BT, that necessitate the IAA providing the requisite transparency, accountability and conformity (Edward, 2019).

Blockchain innovation offers the guarantee of a secure, straightforward, quick and reasonable advanced arrangement as well as numerous government challenges (Policy Horizons, 2016). Importantly, this same innovation also posts challenges and often leads to a situation whereby IAs want to supply the greatest esteem to their organizations, despite the challenges arising from outdated governance, risk management and internal controls within the organisation (Vitso, et al., 2017). It is not inconceivable, however, for IAA systems to prepare both blockchain innovation and all blockchain projects from their very inception, and additionally examine the availability for blockchain in terms of the IA's current duties. IAs perform this similar engagements using a systematic, restrictive and evaluating process and achieve completeness and productivity that provides value to the organisations (Kloch & Little, 2019).

Moreover, strategic devices of confirmation are created to frame proficient benchmarks performed by IAs even without the use of blockchain innovation (Rizzo, 2016). However, IAA should consider utilising unused approaches, as well as evaluating the modern BT innovations using a well-established proficient measure to guarantee satisfactory affirmations (Dai, 2017). It should be noted however, that although, BT is an advancement that has allowed the formation of cryptocurrencies, neither cryptocurrencies per se nor blockchain enhancements may be used for the purpose of IAA, because they take advantage of the proximity of these cryptocurrencies in the same way that Transmission Control Protocol/Information Practice (TCP/IP) are used and allow the proximity of online shopping destinations such as Amazon (Iansiti & Lakhani, 2017).

According to ICAEW, 2017), the enthusiastic about blockchain-based applications for the IA perspective, especially on a very basic level requires a change in the way organisations and individuals think about where to find the "truth" about data. This expectation existed until the appearance of BT with a well setup one layout of the truth entrusted in a system purposely for records. A framework of record thereby is considered (Inmon, 2003). Likewise, a sensible system of record ensures one truth and exists in one system, which is subject to BT control structure (Bible, et al., 2017).

2.15 The relationship between Internal Auditing and Blockchain technology

Edward (2019) avers that BT continues to evolve, grow and develop, and there are opportunities and a need for IAs to cooperate with global trading partners and their chosen payment system to test the current controls after the execution of transactions. According to Abreu, et al., 2018a), IAs currently require the ability to verify the accuracy and validity of the flow of information between partners, and funds through a payment system, and record the information into blockchain ledgers. This new position satisfies standardised global accounting practices with real-time auditing of individual business transactions (ICAEW, 2017).

Patil and Puranik (2019), affirm that blockchain receipts give fundamental responsibility and fill in as an option in contrast to traditional receipts. Utilising connecting plans propelled by timestamping administrations or potentially distributing blockchain headers, secret data are recoverable in the blockchain activity, and it makes blockchain receipts minimal and simple to check and verify receipts, along with mooring, give solid assurances too non-disavowal. As per Walsh, et al., 2020) the public key cryptosystems are utilized when the blockchain

framework are compromised. BT does not need generous costs for keeping up with frameworks and, simultaneously, provides a considerable degree of strength against attacks (Rizzo, 2016).

Ito, Narula and Ali (2017) believe existing money related frameworks are exceptionally complex, and complexity makes more risks, and an unused decentralised money related framework has made trade exchanges and corporate proclaiming with the use of cryptocurrencies that may expel the middleman and, thus, diminish the risk. Cryptocurrencies might also open the financial system and empower more noteworthy competition. According to Naman, et al. (2021), controllers seem to change the money-related framework by reconsidering BT the most perfect way to attain arrangement objectives, without debilitating the measures (Jabbar & Dani, 2020). This practice increases the opportunity to diminish the systemic risk for illustrating clients and controllers' endurance of challenges that are system related. Studies have uncovered that making the framework more client inviting will diminish the control of mediators and charges on clients as regards money related framework (Vitso, et al., 2017).

2.16 The Benefits of Blockchain Technology in Internal Audit Activity

2.16.1 Decentralisation

Peer Production (2017) state that decentralised plan and the structure of the computer framework present certain characteristics that are appropriate for bookkeeper, which also influence the security of the client. Ahmad, Salah, Jayaraman, Yaqoob, Ellahham and Omar, 2021 Mohamad et al., (2020b), confirm that they can keep information private but if the framework is not legitimately outlined, decentralised infrastructure's dual requirements of freedom and security may be difficult to ensure. Swan (2015) states another challenge that is related to commerce models, namely that conventional commerce models might not appear pertinent to Bitcoin since the full point of decentralised peer-to-peer models are that there are no mediators to require a cut or transaction charge, as in classical trading systems (Uddin, et al., 2021). Decentralisation and the usefulness of decentralised exchange records cannot be utilised for crypto monetary forms, but to enlist and affirm any kind of contract, money related framework or property specialty (Swan, 2015).

2.16.2 Recording of Transactions

The computer system receives new data transaction requests that are added to the order book. A match is identified between data transaction requests and hashes associated with the digital wallets and linked with the respective data transaction requests are generated (Zhang, et al., 2019b). Relatedly, the counterparties receive the hashes of the other party along with information on the match and each party causes blockchain transactions to be added to the blockchain of the computing system (Berryhill, et al., 2019.; Ståhlbröst & Lassinantti, 2015). The computing system's blockchain then monitors and determines if both sides of the coordinate have been included in the blockchain (Beck, Müller-Bloch & King, 2018; Fay & Paniscotti, 2016).

2.16.3 Authenticity

Kostic and Tang, (2017) asserts that authenticity is known to be genuine, and it is reliant upon the development and keeping its original existence state the identity and integrity of the record. Agreeing with (Roger, 2015), reliability and record authenticity is in official order in standard for current records management such as ISO15,489, (2001). Generally accepted record keeping, principles include when digital record are established and maintained for a period in the system (i.e., "original systems") and the period differ for the purpose of the transaction or record (ARMA'S, 2013).

2.16.4 Reliable records

A record system process continuously records all transactions within the scope of business functions and arranges the records that reflect the business processes of the company (Mohamad et al., 2020c). In addition, this process protects the records from unauthorised access of the modification of data procedure functions as a primary source of information about activities that are documented records to provide ready access to all records and metadata (ISO, 2001; Patil & Puranik, 2019).

2.16.5 Cryptographic "solving codes".

According to Levy (2014) blockchain uses "cryptographic signatures and public keys which are linked to the recording of transactions that occurred such as digital cash or any other ledger records. Crypto proof replaces the "notary". (Uddin et al., 2021) state that the potential and

confidence of this new BT is growing and spreading fast compared to Bitcoin, even among professional record-keepers, while, Jabbar and Dani (2020) believe that crypto serves as a security to transactions executed because the parties involved have a digital signature.

2.16.6 Cryptography Used as an Internal Control.

2.16.6.1 Cryptography

Kshetri, (2017a), information is secured against unauthorised use, acquisition, or alteration (Cryptography, 2018.). In the field of information security, cryptography is connected to the back of capacities and organisations characterized under them.

2.16.6.2 Encryption

Kloch and Little, (2019) mention that encryption a revocable arrangement for transforming data into a form that obscures its meaning and then keeps it secret or private. (Naman et al., 2021), stated that the most used type of encryption can be a cipher and a process in which the livelihood guesses the keys as an input, a reversible plan, and which is based on roughly cryptographic text common encryption codes and steganography (Kodapanakkal et al., 2020).

2.16.6.3 Confidentiality:

This is the process to enhance BT's capacity to store data in a form that makes it incomprehensible to third party (Deshpande, Stewart, Lepetit & Gunashekar, 2017; Zhang, et al., 2019b). Confidentiality entails the following components.

- **Integrity:** the capacity to store data so that any modification made by a third-party to data will be detected.
- **Availability:** the capacity to retrieve information when it is required, despite the credibility of operational unsettling influences, denial-of-service ambushes, etc.
- **Authentication:** verification as a predecessor as well as authorisation and to obtain control over the system used provided control is applied adequately.

2.17 Technique Used by Internal Audit and Blockchain Technology.

The following are related systems within blockchain that IA focus on when providing services in BT as the concept and expectations as follows:

2.17.1 Replicated Log Structure.

Replicated log structure consists of several servers, each of which maintains a local replica of the global log. Replicated log is protocol agreement to reach common understanding among servers as to the system's ability to provide transparency and an integrated audit trail (Kostic & Tang, 2017; Rückeshäuser, 2017b). Replicated logs are used for fault tolerance, for example there is a requirement for a system to remain operational under the assumption that some hardware or software components may fail (Rizzo, 2016).

2.17.2 Byzantine Faults Tolerance

Wu and Gao (2020) mention the inconsistent behaviour of exact copies, whether it is caused by benign errors or an active opponent. Byzantine Faults Tolerance (BFT) admits algorithms that include Aardvark, PBFT, QU, RBFT and Zyzzyva. Fault-tolerant systems have well-defined limits on tolerating errors (Älvebrink & Jansson, 2018), for example: if the system is pessimistic and asynchronous, it is impossible to come to an agreement with even a single faulty server, and if message transfer and processing are arbitrarily slow, the network may be only partially synchronised (Andoni, Robu, Abram, Jenkins, McCallum & Peacock, 2019). Although, message transfer and processing often are available, a priority is unknown. There may be a number of faulty servers in the system at the same time (Andoni, et al. 2019), the minimum number of servers required for a functional ordinary fault tolerant system is 2f + 1. The minimum number for a BFT system is 3f + 1.

2.17.3 Agreement and Maintainer Networker.

Killi (2019) confirms that the networkers participate in the agreement, and all networkers keep and maintain an up-to-date system and the complete audit log. Also, if required, agreement networkers are identified by algorithm (Wu & Gao, 2020).

2.17.4 Verifying Auditing Network.

Zhang, Wang, Wang, Fu and Wang, (2021) mention that networks used to verify auditing are operated by external auditors, and the networkers are not involved in an agreeable pact, but however, maintain complete blockchain. Agung & Handayani, (2020) affirm that an auditing networker can verify correctness of all transactions occurred or arbitrary subset of transactions not known to the system maintainers. Patil & Puranik, (2019) state that the network may

perform online verification of incoming blocks of transactions and verify transactions on demand.

2.17.5 Lightweight Networkers.

These are network operated by clients to satisfy their needs in the simplest audits, Lightweight networkers are not involved in the agreement and do not store full system state and blockchain processes (Ismail, Materwala & Zeadally, 2019). Lightweight networkers copy blockchain headers and transactions related to the client to limit transactions the networkers have access to and, to identify lightweight networker (Seok, Park & Park, 2019). Providing protection from local and international attacker, all components of the system need to be BFT with expected extent of redundancy, and if there are centralised components, such as an authorisation verification module, they are required to be incorruptible (Xu, Wang, Yang, Ren, Zhang & Zhang, 2018).

2.18 Internal Audit Activity Decentralization and Internet of Things

According to Duan & Guo (2021) developing weight on the proficiency and quality of operations proceeds to drive organisations towards digitalisation and IoT. Renault, Agumba & Balogun (2016) state that the extended level of data and truthfulness finished through the digitalisation gives an additional setting by building a virtual copy of the physical generation environment to assist the organisation in decision-making regarding decentralisation and IoT, In addition it ensures satisfactory assurance of information with respect to mental property and data (Rspe, et al. 2020a; Uddin et al., 2021). The capacity of machines and systems to interface and exchange information without human mediation while maintaining quality production through minimised personnel supervision is constantly increasing due to IoT (Nezhyva, Zaremba & Nehodenko, 2021).

2.19 Blockchain Technology in Internal Auditing and Accounting

According to Bheemaiah (2017), BT may be a significant record or possibly merely an important fact. Accounting bookkeeping systems which typically include financial records and are required to maintain these records as part of their workload, make human resources constrained and ineffective in performance evaluation. In a similar way, Dai (2017) affirms that BT changes the setting-up methods for invoicing, documents, contracts, and parcel arrangement, and each exchange of accounting books is performed on the blockchain. On the

other hand, organisations are certainly easier to manage (Swan, 2015). BT is essentially used as part of obligation fulfilment and ambiguous resources such as the base material, an enthusiastic movement of contracts and guaranteed progressive rights (Dai, 2017; Simon, Sheetal, Kasale & Manish, 2018.). Therefore, sales are paid in a system watch in which goods are obtained in line with demand and fine elements and resources can be accessed within the monetary adjustment of the organisation, robotised physically performed transactions, and in the stock system for advantage. The company displays reviewed reports for assessment and governance purposes and these reviews are expensive assignments to be carried out which requires extensive hours and cognitive contributions from accountants comprising audit papers for orders, delivery notes, goods received notes, invoices and payment records that are kept within the organisation and authenticated by a third-party (Dai, 2017).

Additionally, BT render's reliability of records and facts across a hash cord and digital fingerprint, which is unchallengeable because, once a transaction is agreed upon and recorded, it can never be changed. One can subsequently record another transaction to change the state of the first transaction but can never change its history. Therefore, while engraving the data on BT, IIA (2017) standards advice that IAs should continuously acquire "the knowledge, skills, and other competencies" to be able to carry out their obligations. According to Roblek, Meško & Krapež (2016), for BT to be implemented and successfully executed, training on BT should be considered essential for all persons involved in IAA. Brender, Gauthier, Morin & Salili (2017), state that currently IAs are acquainted with the organisation's governance, risk management and internal controls environment, in addition they should have basic knowledge of how BT operates specifically to transform areas such as governance, risk management and control. Rooney, Aiken, & Rooney (2007) likewise point out that IAs should be incorporated in the planning stage of blockchain-based auditing processes. This technological mechanism should have adequate governance, risk management and controls in place while, according to Zhu and Zhou (2016), it is essential to develop the system accurately from the beginning rather than reform it after the problematic issues have been identified.

According to Auditors (2015), IAs' progress should be consistence with the standards provided in terms of the audit framework as well as the available BT-based mechanism (Kshetri, 2017b). Real-time access to information progress auditing will allow IAs to use this real-time access to transactions to increase the value they bring to the organisations and ensure IAA reliability and trustworthiness. Unfortunate, Jabbar and Dani (2020) maintain that the adopting of this new

technology approach is slow and it will take time for it to be fully operative. It is vital that internal auditors maintain client's expectations while continuing to uphold professional standards, (IIA, 2017). IAs should establish a collaborative strategy to ensure that blockchain-based mechanism not only provides value in companies, but is implemented in a coherent manner with vigilant and effective governance. Edward (2019) maintains that while there is agreement that BT can offer substantial value to organisations, due diligence must still be performed to ensure this blockchain mechanism serves its specific objective. According to the IIA 2017's key strategic indicators of success, IAs need to acquire knowledge, skills and insight regarding the organisations they support and serve and possessing knowledge regarding BT is essential. Weiss et al. (2017) illustrated that BT will improve IAs' skills and knowledge in terms of IAA procedure and, thereby contribute to the improvements and most recent innovations concerning computerisation and digitalisation, while ensuring IAs' sound understanding of the method to distinguish, survey and moderate risks related to digitalised forms (Woodside, Augustine and Giberson, 2017; Young, 2016). The above will greatly lead to expertise in common IT controls, such as smart contracts, security, data analytics, data extraction, data handling and compiling quick reports (Rspe et al. 2020b; Shan, Duan, Zhang, Zhang & Li, 2021). The main benefit of BT application mechanism is the provision of adequate accurate assessment on governance, risk assessment and control environment.

Finally, blockchain enables traceable audit trails, mechanises audit and transaction verification processes (Dai, 2017). Global exchanges that take place 24 hours a day, seven days a week, and exchanges of tasks made by personal computers (PCs) that are metric in milliseconds are just a few cases of how the current money framework differs overall from previous years (Ojo & Adebayo, 2017). The main difficulty was to make organisations committed and to be entrusted, above-board and ready to adopt and adapt to new technologies. Tang (2017) believes that BT has growing at a high rate in the few past years, and an improved standardisation of audit procedures, as well as technology, can change the semi-complete or complete mechanism of the audit profession. However, simple audit tasks will also lead to more effectiveness and efficiency and, finally, cost savings. BT will play an equally important role in the audits conducted by accounting firms in future (Rooney, et al. 2017).

In another view, the likelihood of exploring the BT system might be at risk. Vidrih (2018) has pointed out that "there is a need for many things and the search for most ends at Blockchain" and perhaps achieving autonomous mechanism is the main objective of Industry 4.0. Nowadays

the system can autonomously and securely initiate the order in which blockchain is placed between ERP and supplier within a cyber-physical system. Both Kloch & Little (2019) and Pejic-Bach, Bertoncel, Meško & Krstić (2020) maintain that Industry 4.0 offers the various resources to be built from smarter and maintainable technologies and, on the other hand, exploring other methods to improve security risks and flexibility enhancement, and knowledge and skills are required for protecting hyperactive related infrastructure (Dai, 2017). BT has the potential for improving cybersecurity by providing a long-established dynamic mechanism pseudonymised 'the automatic processes' and BT offers modish industry ecosystem the opportunity to cross reference and check transactions while giving assurance and confidentially sensitive data (Bheemaiah, 2017; New America, 2019).

2.20 The Countries that are Using Blockchain Technology.

2.20.1 Estonia

Estonia was the first country to use BT in 2012. It has an extremely high E-Government improvement and, in 2016, it was in 13th position in the UN world eGovernment List (Othman, Razali & Nasrudin, 2020). Estonia has been labelled an outstandingly creative nation by standing as the 24th out of 128 Nations in 2017 in the overall adaptation progression world record (Cornell University, INSEAD & WIPO, The Global Innovation Index 2016; Ojo & Adebayo, 2017). Since 2014, the subject of BT improvement has gained essential ubiquity among private and open instruction in Estonia, and the government have compiled various models and concepts about blockchain advancement (Oscar, 2016). Blockchain development has secured the procurement of more than 1 million open records, i.e., authorised procurement records without the requirement for a centralised trusted party internal or external to the government. According to European Union and e-Estonia (2017), the development depends on improvements made by Guard-time running the blockchain. This method is based on the improvement of Keyless labels from Guard-time, which permit one to see any information without using a private trading schedule and open keys – the strategy that is used in recording and updating prosperity records of viability and practicality. (Pawlak et al., 2018). BT's progressive use also provides the creation of secure and trusted care records into electronic chains of events while ensuring the origin and awareness of the records.

Ian (2015) mentions that officials also opened e-residents at the end of 2014 and Estonia made history by becoming the 'must-see 'country by offering electronic residence to people both

inside and outside the country. Pazaitis (2018) avers that the Estonian government saw this development as a step towards “the thought of a country without borders”. It is essentially a trans-national progressive characteristic, accessible to anyone in the world interested in an independent online commerce workplace. This situation has been made in affiliation with Bitnation, through which a dispersed organisation and a virtual blockchain-based nation is growing (Braz, 2021). The regulation has been used for issuing emergency identification and registration agencies. Additionally, the organisation contacts Estonia and provides its tenants with a public key system card, which is also bought by more than 1000 electronic government agencies. Non-residents can also apply for a government Public Key Infrastructure (PKI) card. The card comes with a four-digit bar number that authorises computerised brands for online registrations that are legally official throughout Europe. Kalev (2016) finds that this activity gives some approval for the Bitnation and it becomes an open-source convention with majestic content. With more than 9,200 applications from more than 127 countries, about 291 companies had been opened through the e-residency program as of February 2016. This activity includes both a public and private sector business format that are also accessible e-residents through the Bitnation platform (Karm, 2019).

According to Ojo and Adebayo (2017), the US stock exchange company, Nasdaq, for e-Resident Shareholders, in collaboration with the Estonian e-residency program, also offers an opportunity to e-Residents and Estonian citizens who are shareholders in listed companies on the Tallinn Stock Exchange. It is also used for shareholder meetings (Ojo & Adebayo, 2017; Prinsloo, 2021). Estonia's e-residency phase will be used for verifying e-resident shareholders, while Nasdaq's blockchain innovation will be used for securely recording votes. The agility and scale of Estonia, combined with the strong Data Society, created a favourable environment for the Nasdaq-Estonian Government cooperation in steering the e-voting program (Kalev, 2016).

2.20.2 Israel

Israel was placed 20th within the UN E-Government Improvement Record (UN Department of Economic and Social Affairs, UN E-Government Survey, 2016; E-Government in Support of Sustainable Development, 2016). This country was ranked 21st within the worldwide development record (Cornell University, INSEAD & WIPO, The Global Innovation Index, 2016). It is a nation that is driven by a solid guard industry, innovative military units and excellent education. Israel is additionally creating notoriety as a centre for advancement and

innovation. This country is ‘one-of-a-kind’ in terms of Fintech, cybersecurity and cryptography and has become a ‘hotspot’ for Blockchain advancement that includes innovative Blockchain-based activities in the open division that Israel incorporates.

Gueguen (2016) stated that Israel is working in conjunction with Australia to realise the objective of making Australia a driving centre in Asia and around the world, by exercising Blockchain, cybersecurity and big data. To make this objective a reality, the Commonwealth Bank of Australia (CBA) has liaised with the Israel government to initiate Blockchain-related headway and changes made by Israel's thriving start-up common system.

The Israel Blockchain Environment, according to Amit (2016), is in extension engaging blockchain-based advancement in other countries, and Israel has successfully built an environment of BT, and eleven blockchain start-up firms are presently in operations within the country. Ojo & Millard (2017) state that the thrust involves utilising blockchain as an information establishment for progressed, chronologically overhauled, distributed and cryptographically recorded data. By progress, all forms of information can be communicated, progressed, organized and referenced in a short time through a recorded segment. According to Cryptography (2018) and Kodapanakkal, et al. (2020), the chronological course of action enables validation through enduring time stamping. Start-up businesses are utilising blockchain advancement as well and, therefore, secure online buys and progressed rights as well tunes, engage the change of cryptocurrencies , pay bills at ATMs, send cryptocurrencies as messages, work for decentralized organisations, buy bitcoin via credit card exchanges (Ojo & Adebayo, 2017b). These developing companies are collaborating around the world and advancement-counselling firms such as Deloitte and Banks both within and outside Israel endeavour to realise this progression, because over 40 best financial instructors and a developing number of businesses inside the country are testing the use of Blockchains as a way of business.

2.20.3 New Zealand

According to Corner (2016) the New Zealand Government is making strides in the agriculture division through BT because it centralizes and motivates business and country investigators to amplify data within key areas that can contribute to economic advancement, as well as budgetary and other usual needs of the country (Ojo & Adenayo, 2017). One of the government's strategies is to build capabilities that will unite the country as well as stay at the forefront of evolving revolts by leveraging on development creation such as blockchain (Hasan

& Chan, n.d.). This innovation specifically focuses on the agribusiness division as well as the supply of food with solid origins, this practice also allows buyers to choose where the food is to be conveyed with freshness, safety and quality. BT strengthens innovation in New Zealand (Phillippa, 2016) and companies are also working with government by providing a stage for transactions, buying and transmitting life through the advancement of BT. During April 2016, the government began a phase of empowering the adult generation with green vitality transmitted from a peer-to-peer network. It is estimated that shoppers will save approximately 4c per kWh when buying via a peer-to-peer system. The 'Ethereum' blockchain is also anticipated to achieve an improved participation speed for peer-to-peer coordination (Wu & Gao, 2020).

2.20.4 South Korea

According to Ojo and Adebayo (2017), BT progression has existed in South Korea for a few years. On February 28, 2015 the Korean government opened the entrances, as well as becoming a mutual platform, for Korean-blockchain partners, between government activities and the organisation of weekly bitcoin exchange programmes. The government is expanding support for the Bitcoin competition creation, whereby five institutions have become involved (Keirns, 2017; Pawlak, Poniszewska-Marańda & Kryvinska, 2018) with BT's aim being to join community votes through Gyeonggi-do's Blocko, a government initiated BT voting course for the community. About 9,000 votes were received through online and offline networks (Dhulavvagol, Bhajantri & Totad, 2020), This blockchain-based course of action complemented a routine specialist vote-based framework by creating a partnership between the government and blockchain-Blocko which is also enabling Korea to develop CoinStack (Ojo & Adebayo, 2017). In addition to its BT based monetary progress, the Government is observing grant meander capital openings as well as well SMEs with BT related headways included. The Government utilised procedures that have contributed to budgetary advancement and an ICT-based start-up that may create inventive contemplations and improvement to modify amplify blockchain based development (Buntinx, 2016). The government has also recognised improvement in BT to be utilized for the ownership of assets and an organisation's settlement as well as acknowledging BT for present-day signs of progress and courses of action in the Fintech industry.

2.20.5 United Kingdom

Hughes (2018) claimed that the transformational potential of distributed record conjointly progressed with innovation, governance, security and interoperability related suggestions. Besides, the UK government accepts that it stands in a strong position to use the benefits and address the challenges related to the use of distributed records of data (Hughes, 2018; Othman, et al., 2020). The Bank of Britain is presently working on supplanting its current real-time net settlement (RTGS) system with one to be arranged to meet for future demands (Peter, 2016.). This project involves the long-run system which must address the needs of key RTGS necessities.

According to Lynsey (2016), government has seen the advantages of BT and is directly running tests on social welfare in order to introduce this convenient blockchain-based Application. Moreover, the beneficiaries are encouraged to download this 'App' to recognise the validity and the security of the technology that the citizen welfare instalment is sent through. This approach helps to control the risk that individuals may be subjected to and, in turn, ensures they benefit from the welfare instalment (Walsh, O'Reilly, Gleasure, McAvoy & Leary, 2020). This adaptable App comprises blockchain framework that records all welfare instalments to beneficiaries, and the activity could be a joint exertion for division in work duties involving Annuities, Barclays, Npower and the capital of the United Kingdom, as well as the GovCoin start-up of UK-based blockchain (James, Tennison, Wells, Fawcett & Harrison, 2016). Government also considers BT important and wants to explore its methodology, including Bitcoin (Sirohi, 2021), since blockchain innovation has been effectively executed in business environments such as government department, banks, accountants and other business environments. The banking industry for instance has executed the BT system and is reaping its benefits

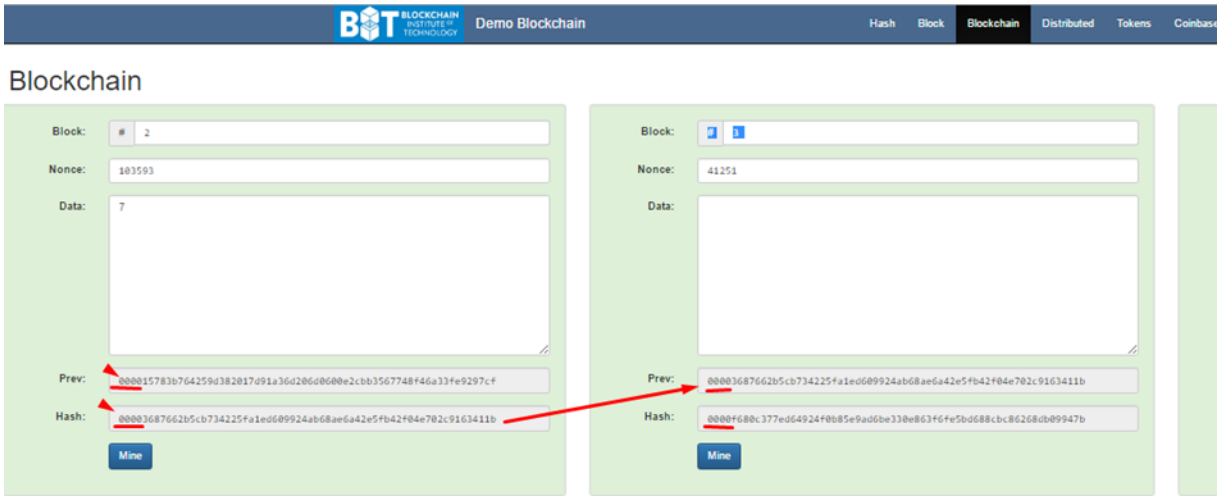

Figure 2: Blockchain framework ***Source: Blockchain by Institute of Blockchain***

Figure 2 above explains how each block starts with a hash of four zeros (fixed algorism). It automatically picks up the previous hash and continues that hash with the transactions. The blockchain and distribution function work in the same way. In addition, the distribution function shows all the peers that are connected and transacting with the organisation or other individuals.

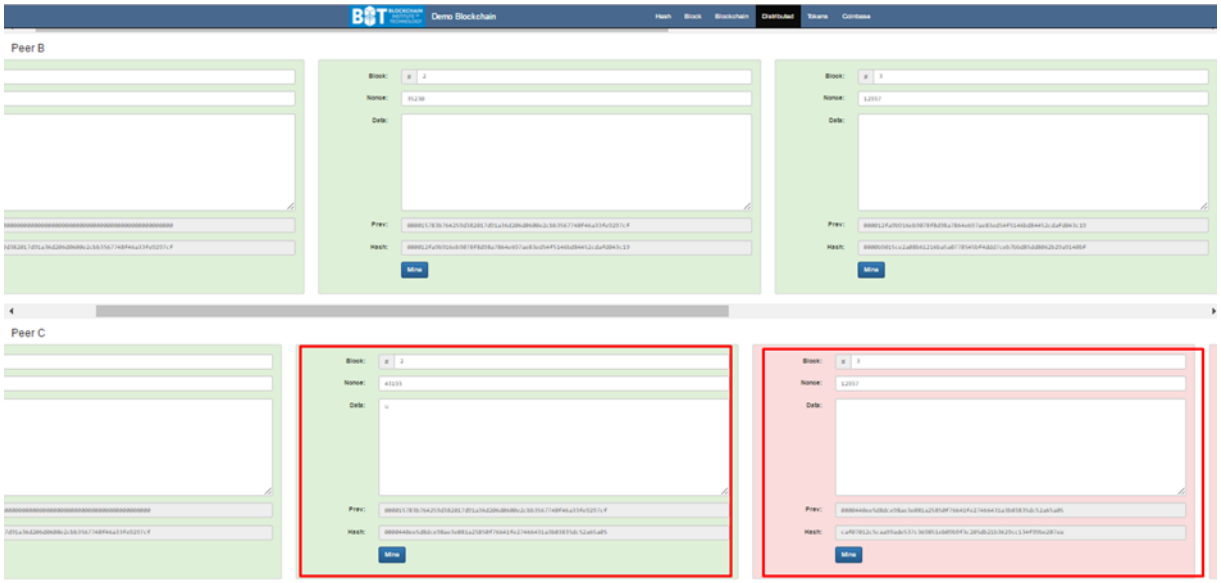

Figure 3: Blockchain framework ***Source: Blockchain by Institute of Blockchain***

In Figure 3 above, the Blockchain is depicted in a green colour and the hash automatically picks up from the previous block. When the peer changes the hash, it automatically changes

the colour to pink as a sign that the hash block has been changed. The blockchain keeps records of any changes made.

2.21 Conclusion

This chapter has looked at the significant benefits of BT as well as the challenges that the IAA systems experience when adopting BT and how this technology can contribute to the organisation. However, it has been identified that not all IAs have the necessary BT knowledge regarding how it can contribute to the organisation. The relationship between the IAA and BT helps to enhance the productivity and performance of internal audit engagement and how Big Data analysis may contribute to the compiling and access of data. Even though BT is still in the initial stages in South Africa, there is great potential that the introduction of BT may change and improve the organisational governance, risk management and internal controls of government departments. The chapter also showed that BT in the organisation may be used for internal controls because it provides transparency, accountability, immutable records and audit trails. Importantly, the COSO framework perspectives on the five components of internal auditing, cannot give recommendations, but overall will change how IAs obtain evidence and how financial transactions will be analysed. Finally, it also discusses how five (5) computerised digital nations, and their governments, have used BT in various ways, such as e-residency and voting. Nevertheless, there are still many issues that need to be taken into consideration such as laws, regulations, ethics and procedural boundaries that will affect the possibility of BT and distributed ledger being integrated into the public sector in South Africa**.**

CHAPTER THREE

RESEARCH METHODOGY

3.1 Introduction

The chapter provides an in-depth description of the research methodological procedures carried out in the study. It focused primarily on providing materials, research designs, and research methodology used in the study. The sampling method, field work, research data analysis and coding process used as well as ethical consideration taken into account are discussed. This chapter described the appropriateness of choosing the research framework and also mentioned the reviewed literature sources. Furthermore, it discussed the limitations of the study,

3.2 Paradigm Qualitative Research

Once the philosophical assumptions have been defined it becomes easier to introduce the five research paradigms underpinning research studies commonly used by researchers. Saunders, et al. (2017) believes that these paradigms assist researchers to identify the methodological choices, research strategy, data collection processes and analysis methods to be used when conducting research.

- Positivism – it focuses on the importance of evidence to uncover the truth, objective in nature and generated only from scientific methods like observations, (Al-Saadi, 2014; Moon & Blackman, 2014; Shah & Al-Bargi, 2013). According to Chetty (2016) a positivism philosophy's concern is in factual findings and methods that need to be adopted should be quantitative in nature which involves hypothesis testing and statistical tools.
- Critical realism- this is a philosophy that originated in the 1970's from a philosopher called Roy Bhaska who believed that there is a difference between the reality that exists in the world and what is observed (Saunders, et al. 2017). (Bogna et al., (2020) explained that "The 'real' cannot be observed and exists independent from human perceptions, theories, and constructions. The world as we know and understand it is constructed from our perspectives and experiences, through what is 'observable'. Thus, according to critical realists, unobservable structures cause observable events, and the social world can be understood only if people understand the structures that generate events".

- Interpretivism – seen as a critique to positivism, these opinions are of the view that human beings are not familiar to physical phenomena, they can create meaning which clearly differentiate natural science from social science (Saunders, et al. 2017). According to Al-Saadi (2014) this philosophy states that observation is not the only way to acquire knowledge or to know about the world because human beings have their own perceptions and interpretations to a scenario, therefore knowledge of the world is not only based on experiences but one's understanding of the reflection of events.
- Postmodernism - emphasises the world-making role of language and power relations, it seeks to question the accepted ways of thinking and give voice to alternative worldviews that have been marginalised and silenced by dominant perspectives (Saunders, et al. 2017). It deconstructs data to expose the instabilities and absences within them.
- Pragmatism – it is believed to have originated in the late-nineteenth–early twentieth-century by Charles Pierce, William James and John Dewey who are USA philosophers who aimed at reconciling objectivism and subjectivism, facts and values, accurate and various contextualized experiences assert (Saunders, et al. 2017). The paradigm uses mixed methods, that is, both quantitative and qualitative methodologies in their studies (Creswell, 2014).

This, study adopted a subjective, epistemology during which the, researcher, interacted, with, participants, to, gain, insight in order to, formulate, a, clear, understanding of the, phenomenon being investigated, namely: how, IAA may, transform into, the, use, of, BT., The, study, considered the, real-world experiences, and the researcher processed a general opinion of participants by exploring their experiences and views about IAs utilizing BT within the context of their job (Bogna, Raineri & Dell, 2020).

Several research problems do not lead themselves to an experimental or even quasi-experimental design. In qualitative research, some historical precedent exists for viewing a theory as a scientific prediction or explanation for what the researcher expects to find (Kivunja, 2018). (McBride et al., 2020), affirms that a theory is a set of interrelated constructs (variables), definitions, and propositions that present a systematic view of phenomena by specifying relations among variables, with the purpose of explaining natural occurrences. A theory might appear in a research study as an argument, a discussion, a figure, or a rationale, and it helps to explain (or predict) phenomena that occur in the world. (Saunders et al., 2019) added to this

description the idea of a rhetorical rationale, which is specifying how and why the variables and rational statement are interrelated. Creswell, (2014) states that if the frequency of interaction between two or more persons increases, the degree of their liking for one another will increase vice-versa.

According to Chetty (2016), positivism sees social science as an organized method for combining deductive logic with the precise empirical observation of individual behaviour to discover and confirm a set of probabilistic causal laws that can be used to predict general patterns of human activity. The above results is also possible if the researcher has selected an interprevist-positivist method (i.e., qualitative- quantitative paradigm), because the two approaches characterize complementary components of the research process (Creswell & Poth, 2016). An advantage of incorporating both these paradigms into the research process is that the researcher might be able to apply certain of the acquired meanings from the case studies (qualitative components) to understand and interpret the results obtained from the questionnaire (qualitative component).

3.2 Research Method

3.2.1 Qualitative Technique

The study adopted the qualitative method as an approach. Qualitative research is an all-embracing term used to name a number of approaches and techniques for collecting and interpreting research information (Green & Thorogood, 2018). Characteristically, qualitative research approaches are more descriptive, ethnographic, and anthropological in nature. Furthermore, in contrast to quantitative research, qualitative research usually contains a smaller number of research subjects, but is set inside a wider contextual framework resulting in an intimate and concentrated method. The overall result is typically descriptive (Saunders et al., 2019). Campbell and Stanley (1996), authors who are among the most frequently cited protagonists of experimental design in behavioural science, echoed these sentiments by stating that although they strongly advocate the use of experimental design, they are aware that a wave of enthusiasm for experimentation dominated the field of education in the early 1900's, but that this enthusiasm has given way to apathy and rejection of this approach and to the adoption of new psychologies not amendable to experimental verification (Creswell, 2014). In support of this view, (Green & Thorogood, 2018) also observed that research in the

behavioural sciences has borrowed heavily from the experimental approaches used in the natural sciences.

Qualitative technique comprises detailed in fact finding and analytical processes. According to Bubilek (2017) qualitative research is "a 'Gump' term for a wide variety of approaches and methods for [research] study. The data collected and analysed is primarily (but not exclusively) non-quantitative in character. It is a philosophical study that seeks answers to "how", "what", "where", "when" and "why" questions (Greener & Martelli, 2015). According to Atlas, (2017), qualitative research is primarily an investigative approach that is used to gather information and understanding regarding the reasons, opinions and motivation about the research problem and assists in establishing ideas and speculations for future qualitative research. This technique uncovers trends in thought and opinions which encourage researcher to investigate the problem more deeply. Methods that can be implemented to collect data in a qualitative research project are discussion and/or interviews with participants.

3.2.2 Key Aspect of the Qualitative Technique

(Creswell and Poth, 2016), aver that

> "Qualitative design is an inquiry process of understanding based on distinct methodological traditions of inquiry that explore social and/or human problems. The researcher constructs a complex, whole picture, analyses words, reports detailed views of participants and conducts the study in a natural setting".

For this study the researcher used an unstructured questionnaire, which comprises primarily face-to-face interviews and discussions as the data collection instrument. In addition, the researcher personally asked questions and took part in the discussion.

3.2.3 Relevance of the Method in the Study

The qualitative research method utilizes unstructured interviews and open-ended questions to generate data. The researcher interacted with the participants during the interviews and gave participants more detailed information about the topic under discussion. According to Creswell (2003:22), "a mixed-methods design is useful to capture the best of both qualitative and quantitative approaches". Qualitative data was collected by means of a survey interview design, from a sample implementing a standardized research instrument in the form of an interview schedule. Thereafter, qualitative data was collected by means of an instrumental

interview. The mixed-methods approach is usually applied when a researcher tends to base knowledge on practical foundation in order to gain an in-depth understanding of the research problem because this particular approach utilizes strategies of inquiry that allow data collection to occur either simultaneously or sequentially (Creswell, 2003).

3.3 Research Design

Creswell (2014:259), defines a research design as "a set of methods, procedures and techniques used in collecting and analysing processes of the variables specified in the problem research". Likewise, Akhtar (2016) describes a research design as a conceptual outline of how the study is conducted overall and relating specifically to the collection measurement, and analysis of data. This study adopted a qualitative method in the form of open-ended questionnaires implemented by means of semi-structured interviews.

Kennelly, (2018). assert that PAR is a collective, self-reflective investigation that researchers and participants undertake, so they can understand and improve upon the practices in which they participate and the situations in which they find themselves. The reflective method is directly linked to action, influenced by an understanding of history, culture and local context and surrounded in social relationships. The process of PAR should be empowering and give people control over their lives

Kermmis, McTaggart and Nixon (2014) state that the purpose of the PAR design is to show people involved how to change the social world jointly by thinking, acting, looking at the situation and relating to one another differently by constructing other practice architectures to enable and compel the practices in more productive and sustainable ways. The PAR design was selected for the study because it assisted the researcher to obtain information from the sample population and to focus on the characteristics that are under consideration, resulting in an in-depth understanding of the situation (Sendall et al., 2018; .

The aim of PAR is to empower social change by encouraging the participants' ability to progress, Brandenburg et al., (2015) it ensures the cooperation of participants by means of various types of skills, knowledge and proficiency that engages them in growth and distribution of knowledge. Learning strengthens participant's confidence, capabilities, and use of resources which include their ability to develop skills in gathering, analysing, and

using data (Ayaya et al., 2020). The process of PAR is beneficial because it provides insight, understanding and reflection on social issues and creates participants' awareness (Green & Thorogood, 2018). Moreover, it enables the researcher to focus on the present social issues and concentrate on where change is needed (Sendall et al., 2018; MacDonald, 2012; Baum et al., 2006).

Notably, one of the limitations of PAR is the researcher's closeness with participants who may possibly struggle to continue their obligation during the study (Ayaya et al., 2020; Baum et al., 2006). PAR is unpredictable and requires knowledge about the community (Sendall et al., 2018) .Furthermore, there may be a disagreement of viewpoints and beliefs among community member regarding the social issue to focus on and/or the timeframe for change is needed, Kennelly, (2018).

The researcher used Interview technique, and the technique applied in PAR "enable participants to describe their situation" (Sendall et al., 2018; Cardoso et al., 2017). Interview was part of data collection tools that provide the researcher with in-depth understanding, in engaging with participants and providing descriptions about human experiences Ayaya et al., (2020). Referring to Cardoso et al., (2017, states that "interviewing offers researchers access to people's ideas, thoughts, and memories in their own words, rather than the words of the researcher" (p.19). In addition, general topics assist the researcher to find the participants point of view and how they structure their responses, (Sendall et al., 2018; MacDonald, 2012; Baum et al., 2006).

The researcher applied the Interview technique during PAR which "enables participants to describe their situation" (Ayaya et al., 2020). Interviews are part of data collection tools that provide the researcher with an in-depth understanding by engaging with participants and obtaining descriptions of their personal experiences. (Saunders et al., 2019) and states that "interviewing offers researchers access to people's ideas, thoughts and memories in their own words, rather than the words of the researcher". In addition, general topics assist the researcher to find the participants' point of view and how they structure their responses (McBride et al., 2020).

Due to the Covid 19 pandemic, this study had to be conducted outside the Provincial Treasury premises because the researcher was not allowed to enter this area due to the Covid 19 regulations that had to be observed. Consequently, although the researcher was able to

interview the participants, it was not possible to provide the real-time experience relating to Provincial IAA.

(Sim et al., (2018a) recognizes that quantitative data often involves random sampling, so that everyone has an equal probability of being selected and the sample can be generalized to the larger population. “In qualitative data collection, purposeful sampling is used so that individual is selected because they have experienced the central phenomena” (Creswell, 2003:220). In accordance with the mixed method approach, the proposed study was conducted by applying probability and non-probability sampling and combining both purposeful and simple random sampling in the selection of participants. The reason for applying this simple random method is so that every member of the population stands an equal chance of being involved in the study (Saunders et al., 2019)

3.4 Demarcation of the Study

This research study was conducted at the Motheo District Local Government offices of the Free State Provisional Treasury, Bloemfontein.

3.5 Population

According to Kenton (2020):

> “A population may refer to an entire group of people, objects, events or measurements. A population can thus be said to be an aggregate observation of subjects grouped together by a common feature”.

The sample for this study comprised of seven (7) IAs who were currently working in the Free State, Provincial Treasury in Bloemfontein.

3.6 Sample Method/ Technique and Sample Size

3.6.1. Sampling Technique

The purposeful sampling technique means that the participants were selected because of the defining characteristics that makes them the holders of the data needed for the study (Saunders et al., 2019). The method that researchers adapt to select participants who are able to provide in-depth and comprehensive information about the phenomena under investigation. During purposeful sampling the researcher selects participants based upon specific characteristics to enable the researcher to build an appropriately sized sample comprising individuals with the

required qualities. The study adhered to stratification which means the participants from the Free State Provincial Treasury in Bloemfontein who were involved in the study, met these specific characteristics (Fekedulegn, Alterman, Charles, Kershaw, Safford, Howard & MacDonald, 2019). The criteria employed for selecting the participants are:

1. Currently working as an IA.
2. Working at the Free State Provincial Treasury in Bloemfontein.
3. Qualifications and years of experience working as IA.
4. Gender equality.

3.6.2 Sample Size

Jomar, Fonseca and Ramos, (2021) and Creswell, (2014) sample is a component selected with the intention of finding information is it does not represent a total population of IAs. The Free State Provincial Treasury sample of seven (7) IAs in the IAA participated in the study. The researcher only targeted the Free State Provincial Treasury, thus all seven (7) IAs participated in the study with consideration being made for gender equity and the inclusion of both new entrants to the system as well as the long-term employees.

3.7 Data Collection

3.7.1 Interview Questionnaires

The questionnaires were emailed to the participants. Thus, they were able to provide honest answers to questions relating to provocative issues because their responses were anonymous (Vasileiou et al., 2018). Possible limitations are that participants may not answer all the questions and/or not return the questionnaire. However, the benefits of questionnaires being employed include allowing the researcher to explain the study objectives to the participants, particularly in relation to IAA, thus ensuring a high participation rate (Creswell & Poth, 2016).

The questionnaire required participants to choose from the answers given, and when answering some questions with ‘Yes’ or ‘No’ they had to provide a reason for their choice. The questionnaire comprised both qualitative and quantitative questions within one document.

3.7.2 Face-to-face Interview

Kobus (2007 citing Holstein & Gubrium, 2003) states:

> "An interview in qualitative research [is] an unique form of discussion which provides the researcher with empirical data about social life, by asking participants about their experiences. The interview allows the researcher to gain insight [and] understanding about the phenomena under investigation".

This study used semi-structured questionnaires during an interview to collect data. The researcher used prearranged open-ended questions throughout the discussions and encouraged participants to provide their views and experiences concerning IAA and possible transformation of use of BT (Creswel, 2014). The participants' responses to these open-ended questions provided a detailed perspective concerning transforming IAA into the use of BT.

Face-to-face interviews played a significant role that allowed the researcher to gain understanding, cooperation and build relationship with participants. Interviews obtain the maximum response in a survey study. This technique allows the researcher to ask questions when suitable and pursue follow-ups (Bryman,2016). The researcher audiotaped the interviews and also took notes to support the transcriptions of the recordings for analysis. Observation was not part of the process because Covid 19 regulations were adhered to and the interview process was complex because the researcher and participant were not allowed to meet within the premises of the Free State Provincial Treasury.

3.7.3 Data Validation

Piloting the proposed study questionnaire enabled the researcher to realize errors and also trained her to determine the participants' responses to the questions (Babbie, 2020). This process identified confusing questions and helped to determine the relevance of the questionnaire for finding the anticipated data, before distributing them to the main sample participants. Amendments were made to the questionnaire in accordance with the responses to the pilot study. The amended questionnaire was emailed to all the study participants, and they were given a week to respond to the questionnaire and to email the completed documents to the researcher (Boddy, 2016).

3.7.4 Data Collection Technique

The procedure carried out by the researcher include emailing all questionnaires to seven (7) study participants and later the researcher scheduled an interview as one of the data collection instruments, and the interview was conducted with all participants. Creswell (2014) affirms that questionnaires provide an unobtrusive source that permits the researcher to obtain

physiological and psychological impressions of the respondents from the data provided by respondents. This collection of written evidence saves time and costs for the researcher.

3.7.5 Interview and Reflection Notes

The researcher used interview notes together with a reflective diary during the data collection process. The interview notes included explanations of researcher's reflections concerning conversations, misunderstanding, doubts and stimulation of new ideas throughout the study process (Creswell & Poth, 2016). The study notes contained observations written throughout the interview and discussions with the experts in the field and any data given by participants during the questionnaire's execution (Saunders et al., 2019). The researcher was provided with the prospect of gaining a clear understanding through interpretation participatory thought and use of notes, both of which assisted the researcher in preparing of the following phase throughout the data collection.

3.7.6 Data Coding and Analysis

Wong (2018 citing Bogdan & Bacon, 1982), states that data analysis involves the process of systematically searching and arranging the interview transcripts, observation notes, or other non-textual materials that the researcher accumulates too increase the understanding of the phenomenon. Furthermore, Wong, (2018 citing Patton, 2002), states that analysis is the process of analysing qualitative data and predominantly involves coding or categorizing the data. Basically, this process involves making sense of huge amounts of data by reducing the volume of raw information, followed by identifying significant patterns, and finally drawing meaning from data and subsequently building a logical chain of evidence.

Data analysis was performed on data collected through the questionnaires (quantitative technique) and face-to-face interviews (qualitative technique). The data was collected using an sequentially exploratory strategy, and the researcher used exploratory quantitative data analysis, followed by a qualitative collected database, the second phase was developed based on the findings of the primary databank which comprised questionnaires. The purpose of this method is to establish and improve measurement with a particular sample population (qualitative phase), and a large sample population to be generalized (quantitative

phase), (Creswell, 2014). The triangulation of the data was interpreted together after it has been captured, analysed and constricted.

Notably quantitative data was collected though questionnaires and then coded into various classification to support the final processing of both qualitative and quantitative data. Before finalizing the analysis of the questionnaires, the researcher arranged with the IAs supervisor to look at the questionnaires to assist with coding for the purpose of capturing data into the Statistic Analysis Software and Atlas ti computer system. The researcher derived readings from the data which provided an opportunity to apply evidence acquired from the sample to determine conclusions regarding the population parameters

The preliminary step of qualitative data analysis is to develop familiarities with the data, and during the process of data analysis, the researcher took into consideration of all the data collected though interviews, questionnaires and a reflective dairy. Data was coded with content analysis in mind and by examining similar terms to develop themes

3.7.7 Triangulation

Noble & Heale, (2019:24) defines social science triangulation as a the mixing of data or methods so that diverse viewpoints or standpoints cast light upon a topic. The mixing of data type, known as data triangulation, is often to help in validation of the claims that might arise from an initial pilot study. Johnson et al., (2017), The mixing of methodologies, e.g. mixing the use of survey data with interview is a more profound form of triangulation. The researcher attempted to triangulate the finding from the questionnaires (quantitative-element) and face-to-face interview (qualitative-element) to validate and verify the findings interpreted.

3.8 Ethical Consideration

The Helsinki Declaration 1972 is “vital to obtain clearance from Ethics Committee when human (or animal) subjects are involved in any study of an empirical nature. The implication is that the researcher will construct questionnaires with a view of implementation thereof ethical clearance will have to be obtained”. The researcher obtained the requisite ethical permission before conducting any form of research. Committee of Publishing Ethics, (2018) stated that, anyone involved in the research needs

to be aware of the general agreement about what is proper and improper in scientific research". It is vital that the researcher abides and follow ethical guidelines throughout the study and gives attention to the following ethical principles listed below: (Siti Roshaidai Mohd & Arifin, 2018).

3.8.1 Informed Consent and Voluntary Participation.

The researcher arranged a meeting with management of the Free State, Provincial Treasury in Bloemfontein after receiving the approval latter to conduct research within their organization. The researcher provided written consent forms to participants before implementing the questionnaires. The potential participants were approached collectively by the Provincial Treasury after having been given clarification regarding the aim of the study and data collection process. The participants were given a suitable timeframe (a week) to read and, understand this information and decide whether they were willing to be part of the study, Siti, Roshaidai, Mohd and Arifin, (2018).

It was mandatory for the participants to sign the consent form giving their approval participating in the research project before the implementation of questionnaires. The participants were informed about their rights regarding their voluntary participation in the study and that it was acceptable for them to withdraw from the study process even after signing of the consent form and giving permission for the researcher to record interviews. Nevertheless, with the support of the management of the Free State Provincial Treasury, the seven (7) participants cooperated and participated in the study.

3.8.2 Protection from Harm

The researcher was determined not to engage in any activity that would expose the participants to physical and/or psychological harm. Throughout the research process the researcher was truthful, polite and concerned about the participants' safety. In addition, after the interview the researcher was available to deal with participants' questions and needs or arranged for professional referrals who could provide the appropriate service, Fleming, 2018).

3.8.3 Confidentiality and Anonymity

The researcher believes that the researcher and participants should have a clear understanding concerning confidentiality. Siti, Roshaidai, Mohd & Arifin, (2018) state that information provided by participants during the data collection, analysis and reporting of the results should be kept private and, thus, the study participants did not disclose their names in any form during the interviews and when responding to the questionnaires. This practice means that confidentiality and anonymity were strictly adhered to during this study. The interview session's environment was kept private and the data analysis and audio recordings were destroyed after the study was completed, (Fleming,2018)

3.9 Conclusion

This chapter discussed the techniques used when considering the research design and processes covering population, sample design, data collection and analysis. It demonstrated the basis for the chosen sample size and appropriate ethical consideration were carefully implemented. The next chapter focuses on data analysis and interpretations.

CHAPTER FOUR

DATA ANALYSIS AND INTERPREATION

4.1 Introduction

This chapter presents the findings arising from the study and reflects on the analysis of data collected during the study and the methods used for data examination. For quantitative data analysis (questionnaires) the researcher used descriptive data analysis because it provides fundamental data about variables in a dataset and features likely connections between variables. The illustration of data is presented in the tables and graphs provided below. For the qualitative data analysis (interview) the researcher used both content and narrative analysis. The researcher used content analysis to determine specific words, themes and ideas available within the collected data, the researcher measured and deconstructed the presence, implications, and connections between specific words to form themes. The researcher used narrative analysis to present and comprehend genuine encounters through the narratives of the participants. This approach was considered a rich representation of participants' real-life experiences and their respective implications.

4.2 Characteristics of the Sampled Participants

4.2.1 Personal Profile

The researcher asked specific questions to gain background knowledge about the participants as shown in the table below:

Table 4. 1: GENDER

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	6	85.7	85.7	85.7
	Female	1	14.3	14.3	100.0

	Total	7	100.0	100.0	

The summary depicted in Table 4.1 above shows the frequency and percentage of the total gender of IAs within the organisation. Out of seven (7) IAs only one (1) woman participated representing 14% in the IAA and the rest of the IAs were men representing 86%. This distribution means that the majority of participating IAs are men, thus, the researcher was concerned about gender equality.

Table 4. 2: AGE

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	30-39	6	85.7	85.7	85.7
	40-49	1	14.3	14.3	100.0
	Total	7	100.0	100.0	

The results given in Table 4.2 above shows that IAs between 30-39 years accounted for 86% of the respondents, while those in the 40-49 years age bracket accounted for 14%.

Table 4. 3: QUALIFICATIONS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Internal Auditing	6	85.7	85.7	85.7
	BCom Accounting	1	14.3	14.3	100.0
	Total	7	100.0	100.0	

The results given in Table 4.3 above shows that 86% of respondents have studied Internal Auditing and 14% have studied BCom Accounting.

Table 4. 4: NQF LEVEL

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	National Diploma	4	57.1	57.1	57.1
	Bachelor's Degree	3	42.9	42.9	100.0
	Total	7	100.0	100.0	

The results given in Table 4.4 above show that the higher qualification that 57% of respondents have obtained is a National Diploma, while the highest qualification obtained by and 43% of IAs is a Bachelor's Degree.

Table 4. 5: POSITION

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Admin Officer	1	14.3	14.3	14.3
	Assistant Director	5	71.4	71.4	85.7
	Deputy Director	1	14.3	14.3	100.0
	Total	7	100.0	100.0	

The results given in Table 4.5 above shows the IAA positions held by the seven (7) IAs. The positions of Admin Officer and Deputy Director accounted for 14% respectively, while the Assistant Directors' position accounted for 71%.

Table 4. 6: YEARS OF WORK EXPERIENCE

	Frequency	Percent	Valid Percent	Cumulative Percent

Valid	5	1	14.3	14.3	14.3
	8	1	14.3	14.3	28.6
	10	2	28.6	28.6	57.1
	11	2	28.6	28.6	85.7
	13	1	14.3	14.3	100.0
	Total	7	100.	100.	

The results given in Table 4.6 above shows the frequency and percentage of participants' number of years in the IAA field.14% of the respondent have completed five (5) years as an IA, 14% have completed eight (8) years as IA, 29% of the respondents have 10 years' experience as IA, and 29% of the respondents have a longer experience as an IA and only 14% of the respondents have the longest experience as an IA. The reason why the researcher asked this question was to discover the participants' background within IAA. With such a high level of experience, it is deducible that participating IAs are in a great position to learn and adopt BT.

4.3 Qualitative Study

The assurance of sample size in qualitative study is unique in relation to quantitative study (Boddy, 2016; Malterud, Siersma & Guassora, 2016). Sample size in qualitative study ought to be sufficiently large to guarantee that the significant insights are realised (Hau & Chang, 2021). Saunders et al., (2016), state the sample size should be large enough to create adequate data in order to accomplish the research aim and illustrate the phenomenon being studied (Boddy, 2016; Malterud et al, 2016). The question to be addressed is ascertaining the appropriate sample size for a qualitative study?

Various researchers have suggested different guidelines for deciding a suitable sample size for a qualitative study (Malterud et al, 2016). Saturation level is one of the standards in sample size assurance for the qualitative study (Boddy, 2016; Malterud et al, 2016; Morse, 1995; Saunders et al., 2016). Table 5.3 below provides a synopsis of sample size assurance guidelines for a qualitative study.

Table 4. 7: SAMPLE SIZE DETERMINATION GUIDELINES FOR QUALITATIVE RESEARCH

Sample Size	Research Type	Research Authority
Less than 10	Grounded theory	Boddy (2016)
5-25	Phenomenology	Creswell (2013)
Less than 20	Phenomenology	Bernard (2000, 2013)
12-60	Case study	Adler & Adler (2012)
15-30	Interviews	Creswell (2013)
20-30	Grounded theory	Marshall, Cardon, Poddar, & Fontenot (2013
20-40	Grounded theory	Marshall et al. (2013)
20 - plus	All qualitative studies	Green & Thorogood (2009)
25 plus	All qualitative studies	Warren (2002)

Source: Author (developed from reviewed literature).

Sample sizes of 10 are considered adequate for conducting research amongst a homogenous populace (Boddy, 2016), 5-25 for phenomenology and 15-30 for contextual investigations (Creswell, 2013). Sample sizes of under 20 participants guarantee most extreme investment and association of members (Crouche & McKenzie, 2006). For qualitative studies sample sizes of 20-30 are suitable for analysts utilizing a grounded hypothesis to request information (Creswell, 2014; Warren, 2002). In addition sample sizes within the range of 12 to 60 participants, with a mean of 30, are also fitting (Bryman, 2016 citing Adler & Adler, 2012), while 20 or more participants is an acceptable sample size for a qualitative study (Green & Thorogood, 2018). Alasuutari, Bickman and Brannen (2008) lament the shortfall of an optimal sample size in a qualitative study

As indicated by Bryman (2016) the sample size for a qualitative study ought to have the option of providing sensible and persuasive conclusions yet will shift from one circumstance to another, consequently analysts in subjective investigations should adjust the sample size according to these influences. Boddy (2016) and Creswell and Creswell (2007) note that as a rule, sample sizes in qualitative study ought not be so small as to make it hard to accomplish information saturation, theoretical saturation and/or information dismissal. Simultaneously, the sample ought not to be so large that it is difficult to attempt a profound, case-arranged investigation.

Based upon information gained from the above proposals, the sample size chosen for this study's interviews was seven (7) participants as dictated by data saturation.

Table 4. 8:SAMPLE SIZE FOR IN-DEPTH INTERVIEWS

Department	Sample size
Director general's Office	1
Administrative Department	1
Internal Audit and Compliance	4

Risk Management	1
Total Sample Size	7

Source: Own compilation

The researcher observed that the theoretical saturation was reached, and meetings with seven (7) participants were conducted. The principal point of qualitative study is to gather rich data and not merely to infer results (Berg, 2001). Consequently, a small sample size of seven (7) was concentrated upon in an extraordinary profundity, and this size seemed reasonable (Vasileiou, Barnett, Thorpe & Young, 2018).

4.4 Data Quality

As indicated by Creswell, (2014)), the quality and thoroughness of a study come from the legitimacy and trustworthiness of the research methodology. The researcher needs to apply explicit assessment procedures to improve data quality and ensure meticulous investigations. The following sections explain how data quality and meticulousness was covered in this study.

4.4.1 Data Quality and Rigour in Qualitative Studies

Qualitative studies do not typically utilize standardized research instruments (Saunders, et al, 2016), and frequently they adopt non-probability testing procedures and more modest sample sizes (Bryman, 2016; Sekeran & Bougie, 2013; Tansey, 2007), thus, evaluating the honesty of qualitative discoveries is difficult.

Qualitative studies typically utilize four standards for guaranteeing information quality – credibility, dependability, adaptability and confirmability (Hau & Chang, 2021; Labaree, 2020). These principles are comparable to internal and external validity and legitimacy, lack of bias, and an unwavering quality in quantitative investigations (Labaree, 2020). The following segment presents a discussion of each of these four principles.

4.4.2 Credibility

Credibility and believability closely resemble internal validity and legitimacy (Saunders et al., 2019). Validity is the degree to which the gathered data and the outcomes are reasonable and

reliable (Guest & Namey, 2015). Merriam (2009) asks "How consistent are the research discoveries with the real world?" The researcher utilized grounded research strategies and tools to guarantee validity in this particular study. Qualitative research also includes the utilization of a variety of instruments such as surveys and distinctive meeting guides (interviews). In addition, the researcher examined the gathered data prior to reporting the discoveries and, thus, ensured that there was a connection between the discoveries and the findings of the reviewed literature (Saunders et al., 2019).

4.4.3 Dependability

Dependability and trustworthiness is practically equivalent to unwavering quality (Guest & Namey, 2015),thus indicating degree to which similar outcomes are seen under comparative conditions (Anney 2014). This principle indicates the degree to which study results can be duplicated Kumar, 2015). Dependability is often difficult to ensure because it constantly relies upon different variables (Kumar, 2015). In an attempt to improve dependability, the researcher gave an in-depth methodological description to ensure the study could be reproduced with same outcomes being found and new information arising. The researcher likewise, provided sensible time and attention framework in order to guarantee that the interaction of research was logical, traceable, and distinguishable. In this manner, the researcher distinctly achieved the research process

4.4.4 Adaptability

Adaptability relates to external validity and legitimacy in quantitative study (Shenton, 2004). It alludes to the degree to which consequences of the study can be applied to various settings or circumstances (Saunders et al., 2019). Ayaya et al., (2020) claims that adaptability is a significant test because the researcher's subjectivity is the critical instrument in qualitative study.

To guarantee the generalisability of this research, the researcher gave an itemized and rich depiction of the settings considered. This practice was to guarantee that readers are furnished with adequate data to empower them to pass judgment on the pertinence of the research results in terms of different settings or populaces they know by making their own judgment as to the adaptability of study results (Babbie, 2016). Also, throughout the study's progression cycle the

researcher was sensitive of likely inclinations by being aware of the possibilities of other people perceiving of various understandings of the study's discoveries.

4.4.6 Confirmability

Boddy, (2016) mention that the researcher should ensure that her/his perspectives should not control the understanding of data gathered. Subsequently, confirmability implies that the understanding of discoveries should be founded on or upheld by data given by the participants and not fabricated by the researcher. Shenton (2004) likewise affirms that researcher should be fair with respect to their administrative decisions in order to ensure that a reviewer would be able to affirm their findings. Furthermore, to guarantee confirmability, qualitative data investigation depends upon the participants' voices being reflected by direct citations in the qualitative discoveries segment of data analysis.

4.5 Data Quality in Quantitative Studies

Quantitative data quality is a significant concern of all administration and business specialists. Dependability and legitimacy are the two most significant quality measures in quantitative study (Saunders et al., 2019). Creswell & Poth, (2016) also suggest that this two data quality ideas verify the logical thoroughness the researcher has invested in the study. The accompanying segments explain how quality and diligence were guaranteed in the qualitative period of this study.

4.5.1 Reliability

Anney (2014) mentions that dependability involves the degree to which steady outcomes are found by utilizing a similar research instrument. Boddy, (2016), agree that dependability shows the degree to which an action occurs without error and add that unwavering quality is apprehensive about the security of results.

The essential reason for dependability is that research instruments should create comparable outcomes when re-tested on similar participants on various occasions (Saunders et al., 2016). Consequently, to guarantee dependability, the researcher drafted the instrument in such a way that instrumentation, data, and discoveries were controllable, unsurprising, reliable and replicable (Boddy, 2016). Moreover, the researcher established that the respondents would effectively comprehend the data collection instruments (Babbie, 2020). Essentially, a pilot

study was performed to evaluate the questionnaire's unwavering quality. The questionnaire's reliability was tested utilising for data collection. (Ayaya et al., 2020).

Triangulation different data collection methods were used such as, questionnaires, interviews and filed notes, were applied to the post situation. These methods are often found in qualitative research. Interviews are used in phenomenology research and to some extent in hermeneutics. Open-ended questionnaires provided responses from the subjects and given an overview of the phenomena under study. questionnaires contained questions where the responses are quantitative, e.g., by using checkboxes and written explanations, but such approaches are not considered here as they represent a methodology outside the scope of this study. Interviews provided insight into how IAs would adopt BT – audio interaction. This approach also allows more flexibility in data collection because follow-up questions were asked, which was not possible with questionnaires. Collecting descriptive data from interviews was beneficial when the research field is relatively unexplored. Fieldnotes were used to capture the experiences the researcher came across, IAs demonstrated how the Teammate system was used to plan and generate the internal audit engagements but other internal auditing modules were not work in the system that they had to perform and develop other internal auditing engagement manually such as using excel sheet to populate the data for the internal auditing engagement plan. Audio recording was used to collect data as it was used for an interview with the participants, the researcher made aware the participants that the interview will be recorded and used as data collection. All data collected was uploaded to Atlas it, data was compared and allowed the researcher to create codes and themes for data analysis.

4.5.2 Validity

The concept of validity in research is also rooted in the quantitative research paradigm. According to Babbie's (2016:148) definition, 'validity' refers to the 'extent to which an empirical measure adequately reflects the concept it is intended to measure'. This definition elicits the underlying background that validity is rooted in the quantitative paradigm where measurement and numbers are fundamental. In this current qualitative phenomenological study, which employed interviews as a data collection mechanism, validity was considered based on the views expressed by participants. According to Silverman (2016), the expressed views can be validated based on the participants' experiences or views, which are an outcome of an interview situation. Silverman's (2016) argument supports Maxwell's (2013) view that

the evidence and the applied research methods validate the study. This is because the evidence was collected from participants as sources of information (Creswell 2014; Maxwell, 2015)

There are eight validity strategies that have been identified by Saunders et al., (2019) that are often used by qualitative researchers. Most relevant to this study are the following:

- clarifying researcher bias from the outset; and
- use of multiple and different sources, methods and theories to provide corroborating evidence and to enhance validity.

The concept of validity is applicable in qualitative research, however, due to the fact that validity in qualitative research does not fit exactly as it would in quantitative research, (Maxwell. 2015; Kumar, 2014) proposed ways in which validity can be expressed in qualitative research. They proposed an audit inquiry for qualitative research to determine rigour for qualitative studies. The criteria identified for qualitative studies include credibility, transferability, dependability, conformability and authenticity (Kumar 2014). Creswell (2014) also alluded to the identified criteria to be employed in qualitative studies instead of the concept of validity.

4.5.2.1 Trustworthiness

Trustworthiness in qualitative research is similar to internal validity in quantitative research according to Kumar (2014:368). Trustworthiness of a study is rooted in the truth of the findings. It is about establishing whether the results of a qualitative study are believable or true from the participants' perspective (Kumar 2014:219). The measures to enhance trustworthiness are in accordance with Creswell's (2014) suggestion of triangulation is multiple technique that involved in corroborating evidence obtained from participants.

4.5.3 This principle was applied in the study as after the researcher employed the nonprobability purposive sampling.

The employment purposive sampling was to ensure that the inclusion criteria of participants was not missed. The included participants were those who were currently working in Department of National Treasury in Bloemfontein as IAs. Credibility can also be enhanced through data collection tools and methods. The researcher employed a survey questionnaire to support the sampling process and conducted face-to-face interviews using the semi-structured

interview guide. Seven participants were interviewed within their natural setting. The interviews were audio recorded with the permission of the participants. The audio recordings were then transcribed. To further achieve and enhance credibility, triangulation for data sources and data collection, multiple techniques were used in a form of a questionnaire, interviews, the subsequent verbal data transcriptions of the interviews gain understanding of the phenomenon being studied.

4.5.3.1 Transferability

Transferability is another technique that enhances rigour in a qualitative study. As Kumar (2014) put it, transferability is the degree to which results of a study can be transferred to another context. Transferability is judged by whether the findings can be applicable in other contexts. The sampling exclusions meant that not all IAs in Free State province (Bloemfontein) were eligible to participate; only IAs of Department of National Treasury, Bloemfontein could participate. The study can be transferred to another public sector government department but only to IAs.

4.5.3.2 Dependability

Dependability is a concept used in qualitative research in reference to the degree to which the reader can make certain that the findings occurred as the reader says they did (Kumar, 2014). Dependability is a concept used in qualitative research while reliability is used in quantitative research (Kumar, 2014). The researcher aimed to achieve the dependability of the study by employing respondent validation Birt, Scott, Cavers, Campbell and Walter, (2016). Respondent validation is a technique used to validate identified themes with the participants (Kumar, 2015). To further enhance dependability, the researcher provided detailed descriptions of the research methods that were applied in the study. The research materials used, such as the questionnaires, interview and digital voice recorder, are to be kept safe in accordance. The researcher personally conducted the interviews and self-analysed the data. There was no third party involved in the data collection, transcription, and analysis. These measures ensured consistency.

4.5.3.3 Conformability

According to Kumar (2014), a similarity exists between conformability in qualitative research and reliability in quantitative research. Conformability refers to the extent to which results of

a qualitative inquiry can be confirmed by others. Conformability in a study have to depict some extent of neutrality by the researcher to lessen researcher bias. Elo, Kääriäinen, Kanste, Pöikki, Utrainen and Kyngäs (2014) referred to conformability as the likelihood of two or more independent people finding harmony in the data accuracy and the data meaning. The triangulation is used to assess conformability in a qualitative inquiry (Anney 2014). In the study, the essence of the findings was based on empirical evidence.

4.5.3.4 Authenticity

Amin, Nørgaard Cavaco, Witry, Hillman, Cernasev and Desselle, (2020), stated authenticity based on its criteria. The five criteria they identified include fairness, ontological, educative, tactical and catalytic authenticity.

4.5.3.4.1 Fairness.

This refers to the quality of balance in terms of the views, claims, concerns and voices of the participants that should be evident in the text (Amin et al., 2020)

4.5.3.4.2 Ontological.

This refers to the manner in which the research will raise the level of awareness among the participants (Amin et al., 2020; Shannon & Hambacher, 2014).

4.5.3.4.3 Educative.

This refers to the manner in which the research will help the participants to develop and expand their horizons (Amin et al., 2020; Shannon & Hambacher, 2014)

4.5.3.4.4 Tactical.

This is related to the way in which the research will prompt the participants to act (Amin et al., 2020; Shannon & Hambacher, 2014)

4.5.3.4.4 Catalytic.

This refers to the manner in which participants will be stimulated to take some action (Amin et al., 2020; Shannon & Hambacher, 2014). A clear thread of argument is presented throughout the thesis. An attempt has been made in this study to carefully consider the aspects of

authenticity that forms part of qualitative study as suggested by Kumar (2014). Also, thorough attention has been paid to the theoretical attention of the study as suggested by (Saunders et al., 2019).

4.6 Details of Responses from Participants

4.6.1 What is the current system used in internal audit activity?

All seven (7) participants stated that the current IAA used within the Free State Provisional Treasury is Teammate Software version 12.2 update 3 Teammate+. Out of the seven (7) participants, three (3) explained the benefits of the system they used, thus the researcher will code the benefits of the current system (Teammate) from the respondents' perspective.

Respondent 2

"It's spend less time documenting and reviewing and more time providing value-added services".

Respondent 3

"User friendly and convenient., allows for remote access(teammate+) can be replicated to work from anywhere (Ver 12.2) Automatically backs up information."

Respondent 5, 6 & 7 all stated:

"It's an electronic system, efficient for collecting and storing data."

Respondent 6 and 7 further commented that:

"It's an extensive integration with Microsoft Office [that] *allows auditors to work in a familiar environment that supports their working practices. Rich content libraries from Audit Net, as well as COBIT and other industry standard frameworks allow you to build your programmes quickly and with confidence. Intuitive design and interface let users get comfortable quickly*"

After analysing the respondents' views regarding the Teammate system however it was found that not all respondents were satisfied with the current system.

Respondent 1 and Respondent 4 shared the same views:

"*No fully operated, not all functions are used within the system, needs regular update, needs regular backups with limited space".*

4.6.2 What would you change about the current system used in Internal Audit Activity?

The following responses indicated that not all respondents are not satisfied with the current system used.

Respondent 1 and Respondent 4 shared same views:

"It will be good to accesses Teammate online and also when working from home".

Respondents 5, 6 and 7 stated:

"The system should be independent and not linked to the departmental network. If the network is down the system is also down, sometimes information can be lost if unsaved. The system should allow the user to use all functions".

Respondent 3:

"*Improve on the creation and merging of replicas so that it does not require one to go to the office to merge the replica. (Version 12.2). The amount of data required to access and use the system remotely(teammate+), it requires a lot of data which is costly hence we would often opt for the use of replicas (version 12.2)"*

This statement below contradicts one of the above statements.

Respondent 2:

"None, it is working as intended".

4.6.3 What method is used for sharing information in internal Audit Activity?

All seven (7) respondents agreed that SharePoint is the method used to share data.

4.6.4 What are the traditional methodologies used for internal audit engagement processes?

Respondents 1 and 4 shared the same views:

"*Traditional audit methodology requires use of paperwork and filing system which is unreliable. This information can no longer be used in the next five years due to the fact that it has to be destroyed in order to create space. Whilst block chain can use the filing system that can be achieved for numerous years and can easily be referred back to in some time*"

Respondents 2, 3, 4, 5 and 7 shared the same views:

"Review our audit universe annually".

Develop a 3-year plan informed by the universe Develop an annual audit plan

Internal Audit Engagements

Planning

- *Allocate resources to the engagements.*
- *Issue engagement notice*
- *Preliminary survey*
- *Document the client system.*
- *Conduct risk assessment*
- *Hold entry meeting.*
- *Approve audit programme.*

Field Work

Execute audit procedures as per the approved audit programme above.

Reporting

Confirm findings with the client Hold exit meeting.

Signoff audit report Issue audit report

Issue client survey for completion by client

Quality Assurance

Review of all procedures and working papers by DD Review of files by DD and CAE.

Quality assurance checklist"

The use of BT will greatly diminish the IA's responsibilities and workload in terms of the long hours that IA's must contribute during a traditional internal audit engagement. The application of BT, combined with the use of other new technologies such as work process computerisation, digitalisation, data mining, robotisation and the use of IA knowledge, will build productivity. This improved practice will allow IAs to use their expert judgment, experience and information on the industry and its executional challenges, to improve and give further internal audits on organisational issues such as governance, risk management and internal controls. This pattern appears to be easily derivable from the use of BT and these findings align with the literature.

4.7 What changes would IAA make in the organisation?

Respondent 2:

"Adaptation of an internal control framework. Regular control self-assessment Culture of control awareness. Adequate and effective system of internal control. Good control environment"

Respondent 3:

"Reporting Structure. Gain the trust of Key Players in the Organization. Quality versus Quantity. Partnering with the External Auditors. Make Sure executed Audits Ultimately Add Value. Being Ingrained, Committed and Positive".

Respondents 5, 6, and 7 shared the same views:

"*Assisting management with identifying and prioritizing areas or processes that require attention and audit focus. It helps an organization accomplish its objectives by bringing a systematic, disciplined approach to evaluate and improve the effectiveness of risk management, control and governance processes. Gaining an understanding of the processes and procedures as they currently exist, especially with respect to the IT systems utilized in the processing of high volumes of policyholder/claims data*".

The researcher coded the participants responses from their questionnaires – 71% of participants expressed their opinion regarding the changes they would implement in the IAA, it was also found that within the IAA there are issues that management should prioritise. One needs to

understand the role and the importance of IAA within the organization. (Klochkov et al., 2018), Assurance Objective assessment is required to give accurate account based on current data to the organization about its productivity, efficiently and adequacy of operations, and compliance to the regulations. Assessment and Recommendations – assessing and making proposals on the viability of the current controls demonstrates an educated, responsible dynamic with respect to morals, consistence, risk, economy and proficiency (Kalabeke, et al., 2019),

4.8 Discussion of Results

4.8.1 Risks and Security issues associated with the current IAA system.

Table 4. 9: RISKS PRESENT IN TEAMMATE SOFTWARE

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	3	42.9	42.9	42.9
	Yes	4	57.1	57.1	100.0
	Total	7	100.0	100.0	

The summary provided in Table 4.9 above shows that 43% of respondents answered ‘No’ and 57% respondents answered ‘Yes' to the risks associated with the Teammate Software system.

Table 4. 10: SECURITY ISSUES IN TEAMMATE SOFTWARE

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	5	71.4	83.3	83.3

	Yes	1	14.3	16.7	100.0
	Total	6	85.7	100.0	
Missing	System	1	14.3		
Total		7	100.0		

Table 4.10 above shows that 71% of respondents answered 'No' and 14% of them answered 'Yes', to the issue of security. The combination of the risks and securities issues associated with the Teammate Software system may be the cause of the delay in internal audit reports due to long hours spent in the internal audit engagement performance. This practices low productivity is the result of the inefficient audit process currently in use which emanates from factors such as lack of management support, limited budget and time (causing the IAs inability to procure the right system), limited scope, lack of independence, lack of compatibility with computer due to the Audit team's lacks of appropriate IT knowledge, data corruption and loss of data. Below are the codes of respondents that the researcher formulated.

Respondents1 and 4 shared the same views:

"*No fully operated, not all functions are used within the system, needs regular update, needs regular backups with limited space".*

"The system should be independent and not linked to the departmental network. If the network is down the system is also down"

Respondent 3:

"100% uptime not guaranteed as its linked to an electricity powered server. Automatic shutdown of server due heat (high temperatures)"

Some of the of respondents contradicted the statements above, and the researcher presents these conflicting ideas below:

Respondent 5, 6 and 7 shared views:

"Information is secured, and we have a server only accessed by the Internal Audit Unit."

4.8.2 Potential factors of Blockchain technology adoption

Figure 4 below is a graph that shows potential adoption of BT by IAA, and Table 4.11 below displays the percentage of variables each item is discussed below:

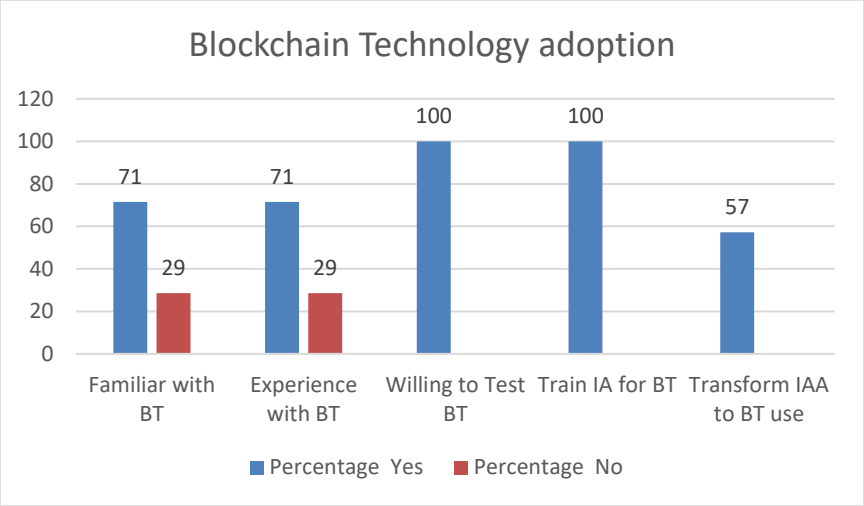

Figure 4: Potential factors for BT adoption

Table 4. 11: POTENTIAL FACTORS FOR BLOCKCHAINTECHNOLOGY ADOPTION

Variables	Frequency		Percentage		Total
	Yes	No	Yes	No	
Familiar with BT	5	2	71	29	100
Experience with BT	5	2	71	29	100
Willing to Test BT	7		100		100

Train IA for BT	7		100		100
Transform IAA to BT use	4		57		57
Missing number					43

4.8.3 Familiarity with BT

The majority of the respondents (71%) stated that they were familiar with BT, they compared Teammate system with BT and pointed out the benefits of BT. The researcher coded their responses. Only 29% of the respondents said they were not familiar with BT.

Respondent 1 and 4 shared the same views:

"A technological recording system used to record information, the system cannot be easily hacked, the information cannot be changed or cheated in some way".

Respondent 5 and 6 also shared the same point of views:

"I believe Teamate and CAATS are block chain technology".

About 29% of the respondents pointed out about the benefit of BT

Respondent 2:

"Widespread blockchain adoption may enable central locations to obtain audit data".

Respondent 3:

"It may assist/ speed up internal audit processes and projects completion time".

4.8.4 The organisation has experience with BT.

A response rate of 71% was obtained from those who said that the organisation (Free State, Provincial Treasury in Bloemfontein) has experience with BT. This opinion opposes the view of 29% of the respondents who said, the organisation has never experienced BT and they did not even know how it operates. This comment proves that these participating IAs lack BT knowledge and understanding and, thus. there is great confusion regarding BT.

4.8.5 The organization is willing to test BT

The returned survey from seven (7) participants represented a 100% response rate, and they stated that the organisation was willing to test BT. According to the researcher this will enhance the IAA productivity and will upgrade the IA skills and knowledge in what to expect from BT and how to implement the correct measures.

4.8.6 Internal Auditors are willing to be trained.

The returned survey from seven (7) participants represented a 100% response rate, and the respondents stated that all IAs were willing to be trained and 'workshopped' regarding BT procedures. BT is the innovation that the public sector should be willing to invest in.

4.8.7 Internal Auditors are Willing to Transform into the Use of Blockchain.

About 57% of the respondents indicated that, they are willing to transform, although 43% of them did not answer 'Yes' or 'No' but rather gave an explanation regarding this statement, which the researcher coded them as shown below.

Respondent 2:

"That would be up to the discretion of management"

Respondent 3:

"If management buys into and approves the concept then internal audit will have no problem".

Respondents 5 and 7 shared the same views:

"Block Chain is the new way to go to enhance the internal audit activity"

The organization's senior management makes decisions which may be considered as strategic plans involving an understanding of the experts' insights in respect of governance, risk management and internal controls. These sentiments are a critical factor because Senior Management's decisions have a real impact on the efficiency and effectiveness of IAA within the organisation.

4.9 Potential impact of BT Adoption

The chart depicted in Figure 4 below shows the potential factors that may affect IAA to adopt and the use BT in the organisation. Each item is discussed below.

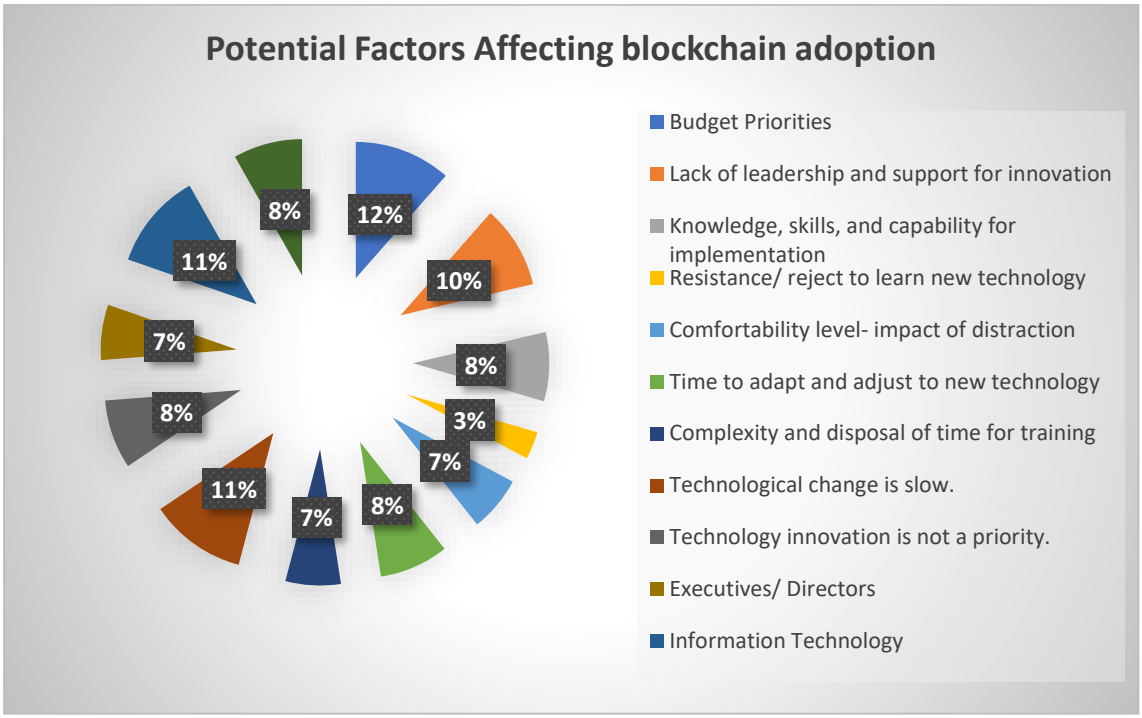

Figure 4: Potential factors that may affect BT transformation.

Figure 4 above shows that 12% of the respondents stated that budget was not a priority for IAA and that this fact contributes to the challenges of BT innovation adoption within the organisation. The IAA system not only focuses on producing the annual financial reports but also is concerned with governance, risk management and internal control environment of the organisation. Figure 4 above also shows that less than 10% of the respondents affirmed the lack of leadership and support for innovation which are critical to enable the IAA system to add more value to the organisation and bring about technology changes. It is implied that IAA should be in the position to change along with the new innovations. Noticeably, 8% of the respondents stated that the organisation lacks the knowledge, skills and capacity for implementation of BT.

Notwithstanding, BT is a very complex issue that is not known by all the participating IAs, as shown by the responses in Table 4.9 above. None of these IAs has been involved in BT and

therefore are lacking knowledge of how BT operates and how to review such innovation. Therefore, it is important for the organisation to integrate new knowledge and skills to upgrade the current IAA system. It is also stated in IPPF Standard (1230) that IAs should continuously obtain new knowledge, skills and competences to ensure their continuing professional development. The study findings have some different results for the IAA. Undoubtedly, "what's to come are described by unmatched hierarchical and enlightening intricacy, with corporate and business detailing developing quickly" (Axelsen, et al., 2017). If the IAs are to be relevant in terms of technological developments, the IAA system should consider what the future internal audit will look like and whether the current IAs have the necessary abilities, knowledge and skills to implement such a system (MacManus, 2017). The Big Four which are KPMG, Ernst and Young and Price Waterhouse Coopers have effectively put resources into the utilisation of new innovations. For example, data analysis, programming, and simulated intelligence programs and have begun confirmation of idea projects on the BT

Nearly half of the respondents (three (3)) agree that resistance to learning new technology would add to the challenge of BT innovation and adoption, based upon the likelihood of such a negative event happening. It is an IA's responsibility to search for other potential techniques and framework to better their position in the organisation because IAA is the core of the organisation, and it should be the system that encompasses technology innovation. Just over 7% of the respondents stated that a lack of confidence when dealing with technological innovations is the main reason why IAs currently do not always perform their duties effectively and efficiently and are always behind schedule on the internal audit reports. These are the main causes why the participating IAs encounter issues in the organisation regarding change of system and methods

The notable 7% of the respondents showed that, time to adapt and adjust to new technology was a potential challenge, as the internal audit engagement has consistently been on a "back-looking" action. They indicated further that, there was a need to get sensible confirmation that the audited annual financial reports are free from immaterial error, but with the use of BT IAs will be able to move away from traditional internal audit assessment process and provide new procedures on internal audit engagement "forward-looking" for the innovation.

Notably 7% of the respondents indicated that not having sufficient time to adapt and adjust to new technology was a potential challenge, because the internal audit engagement has consistently been on a "back-looking" action. They further indicated that there was a need to

receive sensible confirmation that the audited annual financial reports are free from error, but with the use of BT, IAs will be able to move away from the traditional internal audit assessment process and provide new "forward-looking" innovative procedures on internal audit engagement for the organisation.

In addition, 8% of the respondents stated that complexity and a lack of time for training would be potential challenges for implementing BT in the organisation. BT permits controls to be installed, consequently a few procedures and records may require automation. All records will be accessible immediately to the IAA, and these will be subsequently verified and approved by BT. IAA would then be able to motivate that the principal focal point of the IA will not be to ensure the presence and occurrence of transactions, verify of their proof, correctness and satisfaction because such checks will be performed by the actual BT innovation. However, to validate that blockchain is performing as planned, the IA will not just comprehend the BT innovation but also the basic code, thus, the IA should review the connected risks and the issues arising that could adversely influence the organisation. In fact, organisations place incredible dependence upon IAA as a feature of the organisation's technique and activities. Axelsen, Green, Coram and Ridley (2017) show that IAA which will be supported by using BT and various types of advancement to the internal audit engagements.

Moreover, 11% of the respondents indicated that technology change was slow within the organisation, and the subsequent test came from the incompetent manner in which the manual review cycles and tests were presently performed by IAA. However, IAs will require more experienced subject matter experts who are willing to use their specialised judgment to tackle unpredictable issues, investigate information, recognise control upgrades and improvements in a manner that will benefit the organization. This process will influence the traditional internal audit engagement on how IAs deals with the labour force, which is part of a high workload, particularly for the IAs.

Another 8% of the respondents confirmed that technology innovation was not a priority for the organisation. The current IAA additionally foresees that they will want to carry out a continuous internal audit engagement review. In fact, if operational and monetary data are transferred into the blockchain network consistently, and if the IAA have persistent admittance to the BT use by the organization, such a process will break down this data in an ongoing means (Banham, 2017). The continuous internal audit review will likewise provide improved

experiences for the organisation thereby expanding the worth of the IAA as well as bringing review quality to another level because special cases will be recognised and adjusted.

Approximately 7% of the Executives/ Directors and of 11% of the other respondents affirmed that IT would initiate the implementation of BT, and the combined results showed contrasting needs between Executives and IT experts. The IT work-force considers network safety, distributed computing and computerised reasoning to be priority needs, while Executives think about achieving organisational goals at a minimal cost and have a token concern for technological innovation. IT divisions, however, regularly focus on innovation and specialised issues while ignoring the significance of finance and organisational goals and leaving 'cautious speculation' to the Executives. Moreover, network protection is a valid example which, by putting resources into network protection, has minimal direct returns, such as purchasing protection, which is seen an expense based on the likelihood of an adverse occasion happening. The provision of network protection is placed soundly on the shoulders of IT department, however, while the Executives frequently see such protection as overcompensating, they are keen on implementing the BT.

Approximately 8% of the respondents indicated that IAA was also one of the departments that would initiate and implement the use of BT in the organisation, IAA which has been characterised as the way toward gathering and assessing proof of evidence to decide if a PC framework shields resources, maintains information uprightness, permits authoritative objectives to be accomplished successfully and utilises assets productively (Nathalie et al., 2019.). Internal controls may be developed into BT innovation, thus, internal audit engagement review and bookkeeping would guarantee that the innovation is appropriately set up and managed and that mechanised controls are legitimate. Accordingly, IAs will primarily have IT abilities such as programming and whose capacity will be to confirm BT.

4.10 Thematic Qualitative Data Analysis

4.10.1 Narrative Analysis of Interview

The interview data was analysed according to both content and narrative analysis process. From the outset, all notes and recordings were perused to acquire an outline of the body and setting of the accumulated information. The perusing process was followed by a coding process comprising open, essential and coding systems using the Atlas.ti 9 program. The open coding

step encouraged the underlying recognisable proof and stamping of enlightening codes for explicit units or fragments of significance comparable to the analysis points. These recognised codes of significance generally displayed consistency with the inquiries that were posed during the interview. These significant codes, as starter subjective pointers, were again assessed during the essential and specific coding ventures for both understanding and pertinence to aggregate a final rundown of codes. Every class was systematically marked as per the importance of the data. The structure that was arranged through Atlas.ti 9, and which contains all codes and important analysis report is illustrated in Figure 5 below:

Figure 5: Structure output for key codes

The structure diagram above specifically shows the primary code segments of the data analysed and accomplished for the subjective aspect of this analysis. The connected codes of significance from the notes and recordings were deliberately allocated to the last classifications. After a concise presentation of every one of the fundamental parts, a conversation followed that incorporates word for word reactions as models where fitting and as material to upgrade and validate the perspectives of respondents. Primarily, the conversation was based on the frequency of codes from the questionnaire report to clarify any misunderstanding and to explain

certain processes still being conducted as part of the IAA. The researcher assessed and interpreted the conversation corresponding to the questionnaire report, the interview utilised an unstructured questionnaire that was based on the key codes output

Table 4. 12: KEY CODES OUTPUT

Group Code	Code	Teammate	Blockchain technology
	Current system used	Teammate	Blockchain Technology
Course of low productivity	Treats and security issues	Possible loss of data.	With the implementation BT, data is always available, the loss of data does not exist in BT, data is immutable, and it cannot be lost or removed.
	Teammate system operations	Not all functions are used within the system, needs regular update, needs regular backups with limited space and inability to use all function within the system.	Blockchain automatically saves, backs-up and updates data every time new data added to the block.
	Changes in Teammate	The system should be independent, system linked to departmental network SITA.	BT is decentralized ledger not controlled by anyone.
Budget	Cost	Annual certificate renewals, and maintenance which can be quite costly.	Before BT implementation, the organizations will guarantee that the money saving advantage is beneficial to the organisation.
	Methods used to share data	SharePoint	The use of BT will affect how and from where IAA will access data. BT will affect data security.

Data	Data unreliable	paperwork and filing system which is unreliable.	BT data is reliable, data is maintained by nodes in the network.
Traditional internal audit methods	Internal Audit engagement performed manually	Traditional audit methodology requires use of paperwork and filing system which is unreliable. Internal audit engagement is done manually IAA focused on assurance audits engagements.	The use of BT will affect the IA responsibility will either reduce or increase workload and will affect the nature of the IAA services that will provide transparency and accountability. IAA will move from assurance internal audit engagement to more advisory service role.
	Internal Auditors	Internal Auditors role in the organization.	The use of BT will not replace internal audit profession but will have affect the nature of internal audit engagement process and IA judgment and reports given to the users.
Benefit of BT and Teammate system	Benefits of BT	A technological recording system is used to record information, and the system cannot be easily hacked, the information cannot be changed or corrupted some whilst BT can use the filing system that can be achieved for numerous years and can easily be referred to at another time.	When the organisation adopts BT the IAA will access data to perform internal audit reviews. Blockchain are embraced by the IAA and will be used as an internal audit engagement review instrument.
	Benefit of Teammate system	It spends less time documenting and reviewing and more time providing value-added services.	The adoption of BT the IAA will access data to perform internal audit reviews implementation is essential.

4.10.2 Risks and the Security Issues Contributing to Value-added of IAA in the Organisation

The research findings showed that all the respondents indicated that the Teammate system was used in the organisation, however 9.1% of them agreed that there was no guarantee for uptime in the system because sometimes the system shutdown when overheated and they could easily lose their working paper if it was not saved in their computers. From the conversation with the respondents, it can be deduced that while there are risks in the Teammate system, the system can be replicated, meaning the IAs have the ability to work off-line and to up-load the working paper to a master Teammate system. Even though 2.7% of the respondents disagreed that risks in the system do not contribute to the effectiveness and efficiency of IAA and cannot been seen as a cause of low productivity, they still classified these risks as a challenge. The respondents furthermore said that although risk is catastrophic to IA's performance because it affects their duties, they rated this risk as low.

4.10.3 The Causes of Low Quality and High Quantity Performance.

Approximately 4.1% of the respondents stated that, downtime contributes to the effectiveness and efficiency of IAA, because when the system shutdowns, the IA's work piles up. The respondents' examples explaining low quality and quantity contribution in IAA are shown below:

"*IA have annual plan to say if IAA was supposed to have 5 internal audit engagements but only manage to complete 3 internal audit engagement the remining are carried over to the next year. High quantity, if IAA have planned 30 internal audits engagements in the current year only because IAA wants to overachieve, and performs 35 internal audit engagement it can be viewed as pushing quantity and sacrifices the value adding and internal audit quality*"

The respondents highlighted that, if IAA was to perform value adding analysis assessment this activity depended upon whether IAA has contributed to the improvements in department yearly. Conversely, 5.5% of the respondents agreed that low quality was the result of the IAA being more focused on assurance audits engagements which were not viewed as a value adding task. If the department's internal controls were fully functional or reasonably effective, IAA would start to perform more consulting (advisory) audit engagements that would add value to

the organisation. In addition, 6.8% of the respondents concluded that, in adding value to the organisation IAA has to work hard to maintain a certain standard, and that IAA should move away from assurance audits to consulting audits, to add value and improve governance, risk management and internal controls of the organisation.

4.10.4 Regular Update Maintenance and Licence Fee Needs of Current System.

All the respondents agreed that the system needed regular update, maintenance among others. The respondents further explained that, if the organisation were to explore the market to procure a new internal audit system, that would be more expensive than the current system used, because the annual cost for the organisation was put at R20,000.00 including system update, maintenance, and licence for all IA. The respondents also indicated that IAA had received a quotation for the new system which contained the cost of R230,000.00, and this was expensive for the organisation. It was said that IAA should continue using the current system unless the new system had provided something that was better, and the price could be negotiated. Lastly, 8.5% of the respondents stated that even though the new system offered great services that would transform and enhance the value adding of the IAA it was still management's decision to invest and adopt the new system.

4.10.5 The Challenges with Teammate Data Storage.

The findings from 8.9% of the respondents indicated that, the system had limited space, and certain data must be destroyed to create a new space. Another 71% of the respondents revealed that, the server stored up to 3 years of data, and that IAA uses DVDs to store data and files them according to the years to create space on the server, a process which limits data access.

4.10.6 Teammate System not Wholly Operating.

Teammate is the system that provides the comprehension of data analysis, improves governance for strategic and complex judgments, and provides a platform to manage risk and assess internal controls effectively and efficiently. The findings showed that 8.1% of the respondents agreed that IAA used Team-EWP (risk assessment) and some only used a filing system, because certain functions operate but IAA had never used some of them, such as Teammate-IEC and Team-Schedule. There is a need for a budget for training in order for IAA

to be able to use all the functions in the Teammate system. No fewer than 9.6% of the respondents stated that internal audit objectives and scope were conducted manually and, if the system was fully operating, it would populate the internal audit's objectives, scope and generate an overall strategy of fieldwork also a report to be discussed with the client.

4.10.7 The Organisation is Willing to Change, yet Budget is the Issue.

Approximately 9.1% of the respondents foresaw that if the funds were available, the implementation of BT in the IAA would be a satisfactory proposition. The organisation should invest in new technology, training and enhancing skills and knowledge in terms of the latest technologies such as BT and its worth to the organization. While 5.5% of the respondents explained that if IAA required training and it could be internally executed without the need for a budget, such training would be conducted internally by IAA manager. The IAA management was in a good position to offer training and the current system had manual guides, but if a training needs to be executed by a third party, the Head of Department and the Management must approve the decision for training since it involves a budget.

4.10.8 Teammate Connected to Department Network.

Lastly, 9.7% of the respondents indicated that SITA is the primary government department network provider. Teammate is linked to the server, thus, it sometimes may shut-down due to overheating or other reasons, and it contributes to the IAA's performance. The same 9.7% respondents suggested the system used is not independent and, thus, it interacts with their line of duties and responsibilities.

4.11 CONCLUSION

BT is contrasted with computerisation and data investigation that will require changing how financial reviews are performed (Raphae, 2017). BT innovation has the potential only to make internal audit processes change, but additionally to affect the internal auditing engagement processes. Blockchain recording is reliable since it permits adding records and to have different records crosschecking against one another (Martindale, 2016). Moreover, it is constituting a third approval point that did not exist previously, which formerly IAA had to maintain but might not need to do so any longer owing to the blockchain innovations. A significant

opportunity for blockchain innovation could operate with governance, risk management and controls environment as well as internal audits engagements and by encoding instructions directly into the processes. However, despite these advantages, a significant challenge still exists in the adoption and execution of activities depending upon the properties of blockchain innovation.

Even though, according to the reviewed literature, the adoption of BT is very slow it is a process that will eventually be implemented provided that the organisation considers the BT benefits and if these will affect the nature of IAA adversely. However, the shift from how the internal audit engagements are carried out will also shift IA from assurance engagement to a rather more advisory service role to add more value into the organisation and improve governance, risk management and internal controls. The internal audit processes and methodologies will completely change and will move away from manual processes to establish internal audit objectives, scope and fieldwork. With the adoption of BT, the system is computerised and it will provide transparency, accountability, immutable data, reliable data that is accessible to IAA at any time of the internal audit engagement that will bring more confidence to the users of the Internal Audit Report and its recommendations for the organisation.

Even though the IAA is willing to be trained to adopt and transform to the use of BT, the decision to do so does not rest with the IAA personnel but also requires senior management to budget for all activities. In this case, the researcher believes that the top management who uses strategic decision-making methods, will have to invest in IA's skills, knowledge, technology, and other factors that may improve the IAA's performance within the organisation. This process is necessary because the IAA does not only focus on assurance engagements and testing of samples for accuracy, completeness, and occurrence but also oversees at the governance, risk management and internal control environment of the organisation. IAA comprises the core factors of the organization that makes IAs the 'behind scene drivers' of the ship because the organisation relies on their advice and their skepticism and strategic judgment. Without IAA the organisation would probably not survive. In the following chapter, the statement of the research problem, related research questions and objectives will be revisited. Applicable conclusions will be drawn, appropriate recommendations provided and the areas for further research will be highlighted.

CHAPTER FIVE

DISCUSSION AND CONCLUSSION

5.1 Introduction

The previous chapter presented the data analysis and interpretation of data collected from the participating IAs from Free State Provincial Treasury in Bloemfontein. This chapter discusses the findings in relation to the reviewed literature on transforming internal auditing and the implications that may become valuable for the BT adoption and implementation within the IAA environment. The discussion includes theory relating the study, and this chapter concludes with some recommendations, the limitations of the study, possible future research and a brief chapter summary

5.2 Statement of the Research Problem

The first chapter provided the overall understanding and direction of the study. In providing the structure and framework of the study, the reviewed literature was used to present background information on the topic and to outline the research problem which involves investigating how organisations engage and empower IAs to progress and promote social change, and to foster skills and knowledge. With the challenges concerning the absence of abilities, knowledge and skills relating to BT and the changes needed within the organisation to adopt BT, and to boost its advantages to better IAA performance by expanding and create more opportunities for the IAs. Likewise, the adoption of BT is expected to detect operational business risks and modify the approach, to test relevant audit-based data with big data analysis to deliver high-quality evidence within reports and make recommendations for improving organisational governance, risk management and controls. Meanwhile, this study investigated if the solutions offered by BT may be applied in the Free State Provincial Treasury in Bloemfontein. The following key findings (discussed below) were reached:

5.3 Key Findings

The main aim of the study was to explore the adoption of BT within an organization. IAA has significant involvement and contributions with accountability and transparency in the public sector. Rozario and Thomas (2019) state that BT provides data streams that can transform the

internal audit processes, to improve an organisation's services effectively and efficiently. This practice will also permit the IA to detect and identify most of the blunders and irregularities in the IAA frameworks and thus improve the nature of the internal audit engagements and report. The above claims are in accordance with claims by Liu, Wu and Xu (2019) that illustrate that BT will allow full inclusion of data and make the IAA more significant in teams of value-adding activities within the organisation. This outcome is in line with those of Kokina Mancha and Pachamanova (2017), who demonstrated that the benefit of BT permits all omissions of data to be generated. BT will transform the internal audit process, which will become more centred around the testing of controls than the testing of transactions for occurrence, validity, completeness and accuracy.

Data will be secured and validated by BT, the audit process toward in-depth analysis and investigation of the nature of the control frameworks carried out, for example, the nature of the blockchain code, the convention changes and the dissemination of force between peers, will clearly improve the significance of the IAA and provide more added-value to the organisation. This outcome affirms the report from Liu et al. (2019), that BT will enhance the testing of control frameworks instead of transactions, which will be validated and approved by blockchain miners. BT will allow the foundation of a constant review dependent upon current information, and which are formulated progressively in real-time. By replacing the traditional IAA historical data method, this blockchain innovation will provide a new methodology for internal audit processes, improve IAA expertise and relevance, and strengthen IAs as a key component in BT's process and implementation. This process is in line with affirmation from Kokina et al. (2017), that BT offers the IAs the opportunity to perform frequent internal audit engagements consistently because blockchain blocks cannot be modified prior to the internal audit engagement. The accessibility of the data saves time for other tasks and gives the IA the likelihood that in-depth analysis of the data examined will also draw meaningful recommendations for decision-making and provide support for implementation and the likelihood of patterns.

BT will consequently permit the IAs to build a framework as a fundamental agent for the organisation. At last, BT offers IAs a possibility to broaden their scope by proposing new administrations such as constant real-time internal audit assessment and appraisal to set up innovation or to adopt best practices. The BT aimed at the public sector should focus on the

challenges the IAA faces during the internal audit process because offering new forms of administration is a fundamental requirement and, thus, the public sector should take the lead and make it a priority to invest in new innovations such as BT. The achievement of this goal will include recruiting new technological capabilities, skills and knowledge and spending time and finances in acquiring specialised big data analysis in BT and IAA training so that IAs can adapt to future challenges and improve the current IAAs. Furthermore, BT may necessitate revision of administrative regulations, standardising improvements in terms of the ongoing internal audit profession and adjusting the IAA guidelines to incorporate mechanical priorities and data accessibility. Moreover, certain standards covering the IAA process should incorporate BT, such as conducting a continuous IAA review and processing the completeness of data to strengthen organisational governance, risk management and internal control environment. Finally, the adoption of BT will necessitate consideration of various ethical issues.

5.4 The are following four (4) Research Questions are discussed below:

5.4.1 What is Digital transformation of financial transactions through Blockchain Technology?

The data stored on a blockchain contrast from traditional accounting data frameworks in light of the fact that the blockchain contains external proof validated by outsiders, which may ultimately decrease the requirement for current audit review practices and proof gathering exercises. Traditional or customary accounting data frameworks are brought together and overseen by the element under audit review. With blockchain processes, the information is dispersed and by and large, every hub to the framework participates in the approval, decreasing the danger that fake or fictitious entries are scrutinised on the blockchain and entered in the financial statements. Also**,** recognising the internal audit scope relies on data stored on blockchain. The blockchain IAA processes require the IA to understand BT techniques and procedures to access data consent on governance, risk management and internal controls. In addition, blockchain processes have solid governance, limited risk and adequate internal controls that are set up to accept new nodes and approve transactions. IAs validate controls and new access nodes to test if BT operates efficiently as designed, (Rozario & Thomas, 2019).

Teammate is a system used by IAs to evaluate IAA engagements monthly, quarterly and/or yearly within the Free State Provincial Treasury in Bloemfontein. Although, this regular evaluation is indicative of a respectable level of testing internal controls by IAA, 57% of the study' respondents stated that there were risks associated with this system. This comment implies that more attention should be paid to various aspects within the IAA system and could indicate that the IAA process requires improvement through BT innovation. IAA also assesses the objectives of the Free State Provincial Treasury, in Bloemfontein, by testing the governance processes, risk management and internal control environment. More regular testing should be conducted at strategic times within the fiscal year, which could be at the beginning of the fiscal year or at the beginning of each quarter. This finding also influences the IAs' responsibility for supporting the adoption of BT and the values that the IAA provides within the organisation which, in turn, may influence the accountability, transparency and promotion of ethical standards and practices at the Bloemfontein State Treasury. This practice may, in turn, improve the IAA's risk management and internal control environment.

5.4.2 How do traditional and digital internal audit processes Methodologies differ?

BT might change the current perspective on accounting information and on second thought of seeing exactly what was traded in the exchange, the IA may likewise see the cryptographic signature comparing to the transaction. This component provides the IA with a precise and straightforward perspective on business activities and status. The BT innovation also allows IAs and stakeholders to access data more easily and securely. Furthermore, BT may also improve the methods of internal audit and assurance services because BT continuously drives internal audit engagements towards controls-based engagements. BT requires assurance providers to comprehend and assess complex coding, programmed controls and interconnected detailing frameworks more readily across various focal points, (Kokina et al. 2017).

The traditional approach taken by the IAA, which proposes recommendations to mitigate the risk identified and how governance may address the challenges faced by the Free Sate Provincial Treasury in Bloemfontein. The IAA also recommends ways to coordinate activities between the board and the various internal controls in this particular organisation. Notably, each internal audit conducted by the IAA is followed by a report being sent to senior management and stakeholders, highlighting the status of the scope performed and all the

evidence gathered through IAA engagement. A significant part of the IAA report is that recommendations are provided in a variety of ways in accordance with certain IAA standards to support the governance process as well as reducing risks associated with the organisation's objectives that have been discovered and should be improved by the internal control. The adoption and implementation of BT will reduce the time IAA spends on planning and executing the internal audit processes, which, in turn, will improve the quality of IAA services delivered within the Free State Provincial Treasury in Bloemfontein.

Furthermore, BT will change the nature of the internal audits and day-to-day operations of the Free State Provincial Treasury in Bloemfontein because this process creates advantage rather than a revolutionary technology which changes and intervenes traditional internal auditing techniques, thereby creating a new IAA technique. All the study respondents agreed that IAA processes are performed traditionally and manually with a limited timeframe, and the scope the of the engagement which takes time to complete. About 6.8% of respondents agreed that changing IAA will only result from the organisation’s recognition and prioritisation of events that require consideration and assessment to achieve organisational goals, by using strategies systematically to assess the adequacy of risk management, internal controls and governance processes.

5.4.3 How will digital transformation enhance the Internal Audit Activity?

BT are a generally new strategy used to share information across different originations. It gives the opportunity to IAA applications also further develop coordinated effort across multi-originations. Also, BT guarantees information fulfilment, accuracy, correctness and consistency, which help IAA strategies also make more precise recommendations dependent on better quality information. BT can work on the norm of interior review cycles and affirmation benefits by proving high quality proof in a solitary area. IAA can access data through a portal or even as a node to the blockchain. This access allows IA to spend less time focusing on evidence gathering activities for more routine transactions and more time on areas of the internal audit processes that require judgment and professional scepticism.

Additionally, BT is an improvement to the current arrangement of information security and data transfer and offers greater enhancements than the current framework. BT has the following benefits

- BT can further develop effectiveness. It can save time since data is easily accessed by an individual ‘trying not to sit tight for an outsider reaction
- BT can bring down costs. It can eliminate the fees people normally pay to discover essential data. Subsequently, this data is promptly beneficial and capable of gathering further data without depending upon a third-party response.
- Data is more secure because there are fewer chances of it being removed or hacked. Decentralising the data makes data safer. Changes to data is additionally more straightforward because an obligatory record of progress is required.

BT also provides more precise and straightforward perspectives on how the business is functioning, and the progression into BT likewise provides IAs with more efficient access to an organisation's data. BT will transform the audit process, which will become more focused on the testing of controls rather than the testing of transactions. The transactions will be secured and validated by the BT mining community, thus, the IAs will redirect the internal audit engagement toward a more in-depth analysis of the quality of the control systems implemented, such as the quality of the blockchain code, the protocol changes and the distribution of power between peers. All seven (7) study participants are willing to gain knowledge and skills in BT and to test BT in the IAA line of responsibilities, because BT will obviously improve the relevance of the IAA. Further explanation of this practice allows for the argument of the importance of being constantly reminded of being educated about BT and the IAs can benefit through further through workshops and training. Currently, this lack of knowledge can be seen as a gap that also needs to be filled and, in so doing, will ensure that the Provincial Treasury in Bloemfontein understands the benefit of improving the quality of its IAA system.

5.4.4 What challenges do the Internal Audit Activity face in digital transformation adoption?

When assessing the different expenses involved for BT implementation within the Free State Provincial Treasury in Bloemfontein, when executing blockchain, the organisation should consider both introductory and recurring costs related to BT, such as equipment, programming, data changes, adjusting internal techniques and procedures, and employing and retaining appropriately skilled personnel. The planning stage needs to be commenced after choosing to implement BT, and aforementioned cost implications should be a primary focus of planning

activities. With the implementation of spearheading innovation, accessing, employing and retaining an appropriately skilled workforce is frequently difficult and expensive. BT areas that may incur high costs for the organisation are data science, programming and cybersecurity because BT requires skilled specialists in each of these areas for its successful adoption and implementation.

During the adoption and implementation of BT within the Free State Provincial Treasury in Bloemfontein, there might be difficulties in executing framework throughput, or problems may arise with framework redundancy, data size, tractor speed, data adaptability, exchange confirmation and security. When an association chooses to carry out a blockchain arrangement, it may at that point choose a blockchain model in terms of private, public, consortium and/or hybrid. At the innovation stage, the organisation needs to obtain or design the essential committed equipment and programming procedures, make 'savvy' contracts, start entering conditional data and test the whole framework for execution and legitimacy. Eventually, it will need to actuate the blockchain framework as a feature of its normal working frameworks. The execution of a demonstrated innovation is both more direct and predictable than blockchain. With blockchain, the organisation should consider difficulties relating to the innovation's usefulness and effectiveness. Thus, it is advisable for the Free State Provincial Treasury in Bloemfontein to implement a BT model that is suitable for the organisation's needs.

The results of this research study delineated above showed the factors that impact the adoption of BT within the Free State Provincial Treasury in Bloemfontein. A fewer than 12% of the study respondents stated that budget was not a priority for IAA by identifying the high score of various parts of the factors. The IAs would have sufficient resources to perform their responsibilities with diligence. BT presents challenges to the old-style audit approach because it does not have the ability to cater for the existing point-in-time internal audit process, data analysis and audit tool criteria. Noticeably, the IAs are struggling to perform a reflective point-in-time internal audit analysis because what their current activities are ineffectual and marred with incompetence. Meanwhile, blockchain environment assurance is gained from undisputable history and the veracity of its transactions. The BT system has full integrity and one hundred percent accuracy and the IAs' current lack of knowledge and skills present a major set-back for the Free State Provincial Treasury in Bloemfontein because the scores delineated above have shown that 8% of the respondents were not completely satisfied with the fact that

technology innovation is slow and, consequently, IAA are not likely to improve. Another 11% of the respondents stated that the executive initiated innovation in the organisation. The research results also indicated that the IAA system is not independent because it shut-down and, thus, adversely affects their responsibility.

5.5 Theoretical Framework

Resources, such BT innovation answers are defined as the important mechanisms that make contribution to the value adding of IAA. It's far essential for IAs to recognise and understand the factors BT provides for IAA and value adding creation to benefit an organisation and to offer IAs better service performance. The resource-based is when the organisation, obtain an appropriate resource and synthesising them accurately, can create specific values and skills that offer and better the IAA performance to reach the IAA and organisational objectives. The success of IAA relies upon at the organisational capability to concurrently utilise resources in investing in BT and its capabilities within a business context and make choices to supply a valued output.

For decades, IAs have relied increasingly on automation and cooperated with Teammate experts for the creation of recent software program solutions to manipulate the massive amount of data. Therefore, the Department of National Treasury in Bloemfontein are the suitable application of the Resource-primarily based view theory for analysing the value chain made from the BT for data reliability, storage, accuracy, and data accessibility. IAs use data to address issues to develop and plan internal audit engagement for better decision-making. BT in IAA need to appropriately be processed and analysed for the internal audit engagement so one can create talents translated into organisation values. BT strategies, together with, modelling, simulation, system learning, visualisation, records mining and others. These strategies expand models which feed IAs to deal with the extent of work and processing time to utilise BT applications. BT programs and applications allow the distributed processing of data units across clusters the usage of simple programming techniques. The effective use of records analytics tools or techniques may attain organisation’s “agility”. BT is useful for the interested organisation to provide solutions for observed issues based on quantifiable measures and advise options which may result in progressed overall performance of IAA

Blockchain innovations are promising but their potential influence within IAA on the cultural and environment is not yet adequately comprehended by either IAs or organisations, although there are many theories driving the exploration of the consequences of the adoption of blockchain innovation. This research study contributes open views on the impact of blockchain innovation with the IAA environment and its culture. BT's adoption and limitations should be considered because blockchain innovation emphasises decentralisation and immutable data. The researcher recommends that the Free State Provincial Treasury in Bloemfontein should support the implementation of a BT practice that has the potential to improve the functioning of the organisation. This study aims to identify the use of the BT and its techniques and examine the capabilities and values that are created for the IAA and the organisation. These values lead to the need of further investment and training in skills and knowledge in terms of technological innovation for IAA improvements that BT will bring to the organisation. According to the above description, it summarises the research framework.

5.6 Theoretical Implications

This theory was created to comprehend the distinctive ways in which individuals "read" the world and to understand the impact of both their actions and events. The application of BT may place considerable strain on existing systems that will require a basic coping strategy as well as the identification of appropriate adaption procedures. There is a significant consequence relating to how IAs view BT and its operations on real-world networks and how these may significantly impact the IAA system, especially with regard to open-source improvement and decentralised data. IAA fundamentally will be persuaded by BT.

BT developed during the recent decades' computerised innovations. Currently, IAA procedure maintains the traditional approach for testing, reviewing yearly reports and internal auditing processes, thus it appears that a more advanced approach is required in order to perform IAA engagements within a real-time approach. BT offers more accountability and transparency within the organisation and enables IAA reports to become more substantial. BT may also significantly improve governance, risk management and internal control by providing stakeholders with immediate access to data. This benefit may be achieved through changes to management policy in terms of training workshops for IAs to acquire the requisite BT knowledge and skills and for monitoring their progress in the employment of BT. If IAs fully

understand the importance of BT implication and how will it change and enhance their performance in terms of IAA engagements, it is likely that they will support the implementation of BT practices.

5.5.2 Policy Implications

Policymakers embracing advancements ought to guarantee that they adopt a 'tech-impartial' strategy to various applications. Digitising processes, for instance, offer advantages independent of the innovation being utilized. All things considered, policymakers should look to the novel advantages of BT and the difficulties of a task when settling on BT advancement reception. A few ventures will require customary unified methodologies for productivity, while others might be more qualified for circulated, alter obstruction blockchains. For instance, a digitisation project that requires the organisation to provide inputs with practically no controls being set on those information sources might require a blockchain approach. Likewise, regulators ought to apply similar principles to the various innovations used to offer comparative products and services. While facing another innovation or plan of action, regulators should initially take a glimpse at existing standards to see whether they apply to arise applications, which would make a level battleground between the traditional and arising innovation or plan of action. Clearly, all BT applications are not the same as traditional centralised database application and, thus, regulators would not necessarily need to implement controls when dealing with blockchain applications.

In addition, policymakers ought to, essentially to uphold the public authority in the reception and execution of BT by firstly adopting and executing blockchain applications for their own administrations and services, by turning out to, be early adopters, since public, subnational, and nearby legislatures may advance more extensive reception and execution of BT. This practice would likewise assist with lessening the dangers related with hierarchical IAA and urge others to embrace and put resources and invest into BT advancement. These endeavours ought to likewise incorporate solutions for further develop government functional exercises like detailing, the transactions, track resource, supply chain, procurement and budgeting. To, achieve this assignment, organisation might have to, change their continuous interaction, and the organisation ought to, build up a BT administration securing unit, entrusted with working with IAA. This practice suggests fostering a centre group of government specialists for

overseeing blockchain within the organisation who could prompt and work with blockchain-related reception, execution, and other related tasks. Such activity will assist the organisation to accomplish the compelling utilisation of blockchain and try not to, squander cash on projects that are not suitable for the organisation.

Also, the organisation should restructure the IAA so it can assemble data, better educate and instruct IAs, and work straightforwardly with organizations offering promising innovative products and services. The organisation should begin to utilise advances, for example, blockchain for administrative consistence and compliance. This arrangement of solution does not just permit the organisation to comply better with guidelines and regulations, however they likewise work on the quality and proficiency of management by providing regulators admittance to current revealing and investigation framework they can use to find and address abuse of assets. For instance, if the organisation is considering BT by inspection its general advantage and benefit to the organisation, policymakers should approve the organisation to take an interest in this development, and regulators ought to guarantee this process favour the organisation and do not cause substantial damage or increments foundational risks.

5.5.3 Practical Implications of Blockchain Technology

The findings of this study have revealed that BT can possibly change IAA and additionally improve how organisations function. Although BT innovation has numerous likely applications, it still immature, thus, the are numerous chances for the organisation acquire advantage by embracing and exploiting BT innovation. The likely areas of application are corporate governance, risk management and internal controls. Organisations should decide if BT/blockchain innovation is required within the organisation and how will it improve the nature of IAA and maximise its value, particularly because Teammate have arguably failed to live up to the expected standard with regard to IAA.

The researcher remains receptive to the idea of BT adoption. Although this study recognises the potential encompassing of BT innovation, it also acknowledges that there are concerns that this practice generally may not be essential. Therefore, it is significant that the Free Stage Provincial Treasury in Bloemfontein scrutinises the attributes of IAA obligations to decide how blockchain advancement will improve the quality of IAA processes and reports. BT could empower IAA to perceivably improve governance, risk management and internal controls by

calling for more transparency and accountability in a form of modern legislature. In different circumstances, IAA could be assessed based upon whether the adoption of BT would be advantageous, given the estimated costs involved. In circumstances in which BT innovation seems to apply, it becomes significant for the organisation to foster the necessary human resources' knowledge and skills for building, executing and maximising BT's worth. For instance, the success of BT will be influenced by how the organisation uses BT within IAA and incorporates it with different innovations such as programming, data science, network protection/cybersecurity. However, the way in which IAA utilises the data created from blockchain, together with an informed internal audit engagement commitment, is still essential for obtaining responsive conclusions and recommendations. The organisation should also take into consideration that having an appropriate technique for BT implementation and execution across the organisation which will acquire assistance and support from IT service providers.

5.6 Concluding Remarks

The aim of this study was to explore the impact of transforming the IAA into the use of BT in the Free State Provincial National Treasury in Bloemfontein. The study was conducted at the premises of this organisation. The study was built on four objectives which were to determine: (1) the nature of traditional financial transactions and corporate reporting; (2) how this accountancy function which uses traditional IAA methodology differs from one that makes use of BT methodology; (3) how blockchain technology may enhance the internal audit function and (4) the challenges that IAA functions face in adopting and using BT.

Data for this study was obtained through questionnaires and interviews and analysis was carried out using the quantitative and qualitative approach respectively. The findings that were obtained from the seven (7) participants who comprised the target population showed both the potential and challenges of BT adoption and its execution in relation to real-time audit assessment, persistent audit assessment, audit strategies, distributed consensual records in blockchain and related issues. Furthermore, it was discovered that the IAs who conduct IAA in the Free State Provincial Treasury in Bloemfontein are competent in fulfilling their responsibilities and are willing to up-skill themselves with BT knowledge. However, it is very doubtful that BT will ever be adopted by the Free State Provincial National Treasury in

Bloemfontein due to factors influencing its adoption and the fact that technology innovation is not considered to a priority within this particular government department.

On the other hand, numerous applications of innovation affecting areas such as governance, risk management, internal controls administration, accountability, transparency and trust, arose from viable suggestions made by the participating IAs. For example, it will no longer be necessary for IAs to tag data, since BT displays records of all the transactions carried out and, therefore, IAs will not require to ask for numerous files for engagement review demands. IAA audit processes will be conducted essentially on the data of accounts, portfolios and codes connected to the blockchain frameworks.

Despite the agreement that the information recorded on the blockchain is dependable, a third party will not be required to decide whether the physical evidence is appropriately recorded and retained, and this process will continue to justify IA's roles a reality in the organisation. Lastly, considering that nearly all the duties relating to BT make sense based upon possibilities or hypothetical applications, this study presents verification of the concepts outlining the creation and observation of data within a blockchain, since the data represented in an advanced frame of record keeping.

5.7 Potential Recommendations

After the findings of this study, the researcher presents the following recommendations.

- The organisation should revise its policy and regulations with the Teammate service provider because some obligations are not met which adversely affect the IAA performance in the organisation. In line with researcher's findings Teammate is the system that provides the comprehension of data analysis, improves governance for strategic and complex judgments, and provides a platform to manage risk and assess internal controls effectively and efficiently. The IAA used Team-EWP (risk assessment) and some only used a filing system, because certain functions operate but IAA had never used some of them, such as Teammate-IEC and Team-Schedule. There is a need for a budget for training in order for IAA to be able to use all the functions in the Teammate system. The internal audit engagement objectives and scope were conducted manually and, if the system was fully operating, it would populate the

internal audit's objectives, scope and generate an overall strategy of fieldwork also a report to be discussed with the client

- The organisation should invest in enhancing the IAA, specifically with regard to the knowledge and skills of the IAs who are practising within an ever-evolving technological era. IAs should always be assisted to keep up-to-date with new technology innovations. In line with researcher's findings the organizational level, an important issue, training of IAA to assessing the value of machine learning–based aids in practice and avoid the reduction of the skill. This further requires knowledge of how BT learning algorithms work in practice, therefore, it requires the acquisition of statistical and data analysis skills.
- The IAs are the advisors and overseers of the organisation's IAA and, therefore, their training needs should be considered a budget priority, because the IAA cannot function effectively if it is not considered to be an essential part of the organization. In line with researcher's findings, technology innovation is not a priority for the organisation. The current IAA additionally foresees that they will want to carry out a continuous internal audit engagement review. In fact, if operational and monetary data are transferred into the blockchain network consistently, and if the IAA have persistent admittance to the BT use by the organisation, such a process will break down this data in an ongoing means (Banham, 2017). The continuous internal audit review will likewise provide improved experiences for the organisation thereby expanding the worth of the IAA as well as bringing review quality to another level because special cases will be recognised and adjusted.
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- The organisation should rectify the current traditional IAA system. This transition may be in form of ensuring network independence to prevent server shutdown from 'burn-out' in the future which could unexpectedly erase all the existing memory. In line with the researcher's findings SITA is the primary government department network provider. Teammate is linked to the server, thus, it sometimes may shut-down due to overheating or other reasons, and it contributes to the IAA's performance is not independent and, thus, it interacts with their line of duties and responsibilities.

- The organisation should invest in new technology innovations because the current systems are full of limitations involving possible loss of data and data accessibility, that also affects the IAA's efficiency. The new BT innovation has the tendency to make IAA more efficient, thus, adding value to the organisation. In line with the researcher's findings, BT will challenge IAs old practices and will create new protocols of IAA environment. There are no expectations that higher budgets will be given to IAs experts but with the fact that IAA is not prioritised in terms of Skill, Knowledge and technological improvement.
- The Free State Provincial National Treasury in Bloemfontein should encourage IAs to become better acquainted with BT because it provides many benefits not only to IAA, but also to the entire organisation. BT implementation has the potential to make the organisation's governance more efficient by ensuring better risk management and control environment, and solving the issues of transparency, accountability and data access. Such innovations will improve the IAA's effectiveness and also benefit the organisation in general. With the researcher finding IAs lack knowledge and kills about BT and for IAA to adopt BT, it will acquire IAs to go through workshops and training which is another shortcoming that IAs experience since there are not in priority list of skill development.

5.8 Limitations and Avenues for Further Research

This study has certain limitations. Firstly, it cannot exceed the exploratory framework given the limited sample of seven (7) participants. The study focused on a technology whose application is being adopted slowly, and the implications of the current perceptions of IAA's involvement in BT innovation may change. Indeed, some authors have indicated that blockchain adoption will disrupt the nature of IAA work (Elommal & Manita, 2020) while others believe that BT is a promising innovation for increasing trust between different stakeholders, and the benefits it provides for IAA are enormous. However, the possibility of testing the total audit sample and detecting fraudulent transactions remains limited. This study was chosen to explore the possible transformations of the IA profession while considering the challenges relating to the introduction of BT. New research areas are, therefore, open for further investigation. Such new studies might focus on the effects of blockchain on internal control and on the process of preparing financial statements, examining how BT will affect the

recruitment policies of an organisation and/or studying how internal audit procedures may be carried out on BT

5.9 Chapter Summary

The past few decades have experienced exponential movement towards technological innovation and BT is a set to be another step in its advancement. This conceptual paper has proposed a modern typology for BT qualities designed as the disruptive, decentralised and distributed ledger, which summarizes all the designed features of this innovation. The study emphasised the benefits and improvements that may be provided by BT and how BT may enhance IAA, together with organisational governance, risk management and internal controls. Finally, this study has argued that with BT adoption and implementation, risks and data irregularity might be reduced naturally and, in so doing, significantly change the nature of IAA processes and performance. It also recommends that IAA should build a blockchain audit framework based on the assurance engagement to be used within the organisation to suit its specific nature.

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Appendix A: Latter of Request

The Centre for Postgraduate Studies
Bellville Campus
P O Box 1906
Bellville
7537

Head of Department: Mr MND Mahlatsi
Free State Provincial Treasury
BLOEMFONTEIN
9300

26/ August/ 2020

Dear Mr Mahlatsi

Application for conducting research in Frees State provincial treasury for academic year 2020.

I, Lesego Assegaai, Student number: 220042233 registered with Cape Peninsula University of Technology. I wish to apply for your consent to conduct research on Internal Auditing within Free State provincial Treasury.

The details of the research proposal, consent form and questionnaires have been included as an attachment. The research will provide proposals and recommendations on how Blockchain technology can contribute to information technology auditing within the department.

Requested by: Lesego Assegaai

Signature: 

Student number: 220042233

Email address: 220042233@mycput.ac.za

Supported By: Supervisor: Professor J. Dubihlela

Signature _____

Email Address: DUBIHLELAJ@cput.ac.za

Appendix B: Approval Letter

treasury
Department of Treasury
FREE STATE PROVINCE

L Assegaai
Student Number: 22004223
Contact Number: 082 866 9746
Email: 220042233

RE: Request to conduct research in Internal Auditing

1. The above matter bears reference.
2. Please note that approval was granted for you to conduct your Masters research within the department.
3. Any clarity seeking questions can be directed to segalo@treasury.fs.gov.za
4. I hope you find the above in order.

Kind regards

MM Segalo, CIA
Director: Internal Audit
Date: 23rd September 2020

M.M. Segalo C.I.A
Senior Manager
Internal Audit

www.fs.gov.za

Building, Ground Floor, Cnr Fichardt and Zastron Streets, Bloemfontein
segalo@treasury.fs.gov.za

Appendix C: Ethical clearance

Cape Peninsula University of Technology

7535 Symphony Road Bellville
7535 South Africa

Tel: +27 21 4603291

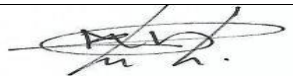
Email: fbmsethics@cput.ac.za

Office of the Chairperson Research Ethics Committee	**FACULTY: BUSINESS AND MANAGEMENT SCIENCES**

The Faculty's Research Ethics Committee (FREC) on **4 May 2021**, ethics **APPROVAL** was granted to **Eugine Lesego Assegaai (220042233)** for a research activity for **Master of Internal Auditing** at Cape Peninsula University of Technology.

Title of dissertation / thesis / project:	**Transforming internal audit into using Blockchain technology within the Department of National Treasury in Bloemfontein** Lead Supervisor (s): Prof J. Dubihlela

Decision: APPROVED

 **Signed: Chairperson: Research Ethics Committee**	**5 May 2021** **Date**

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the CPUT Policy on Research Ethics.
2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study requires that the researcher stops the study and immediately informs the chairperson of the relevant Faculty Ethics Committee.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing

accompanied by a progress report.

5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, notably compliance with the Bill of Rights as provided for in the Constitution of the Republic of South Africa, 1996 (the Constitution) and where applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003 and/or other legislations that isrelevant.

6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.

7. No field work activities may continue after two (2) years for Masters and Doctorate research project from the date of issue of the Ethics Certificate. Submission of a completed research ethics progress report (REC 6) will constitute an application for renewal of Ethics Research Committee approval.

Clearance Certificate No | 2021_FBMSREC_020

Appendix D: Risk Assessment

Cape Peninsula University of Technology

REC 5

Cape Peninsula University of Technology

Ethical Considerations for Questionnaires and Interviews

Faculty of Business and Management Sciences Research Ethics Committee

Tick One Box:

Title of Project: TRANSFORMING INTERNAL AUDIT INTO THE USE OF BLOCKCHAIN TECHNOLOGY, FREE STATE PROVINCIAL TREASURY

Name of researcher(s)

Name of Supervisor(s)

		YES	NO	N/A
1	Will you describe the main experimental procedures to participants in advance, so that they are informed about what to expect?	**X**		
2.	Will you tell participants that their participation is voluntary?	**X**		
3.	Will you obtain written consent for participation?	**X**		
4.	If the research is observational, will you ask participants for their consent to being observed?	**X**		
5.	Will you tell participants that they may withdraw from the research at any time and for any reason?	**X**		
6.	With questionnaires will you give participants the option of omitting questions they do not want to answer?	**X**		
7.	Will you tell participants that their data will be treated with full confidentiality and that, if published, it will not be identifiable as theirs?	**X**		

8.	Will you debrief participants at the end of their participation (i.e. give them a brief explanation of the study)?	**X**		

If you have ticked No to any of Q1-8, you must ensure that the reasons for this are made explicit in your project proposal. [Note N/A = Not applicable].

		YES	NO	N/A
9.	Will your project involve deliberately misleading participants in any way?		**X**	
10.	Is there any realistic risk of participants or researchers experiencing either physical or psychological distress or discomfort? If yes, give details on a separate sheet and state what you will tell them to do if they should experience any problems (e.g. who they can contact for help).		**X**	

If you have ticked Yes to Q9 or Q10 you should ensure that your proposal describes in sufficient detail the appropriate procedures and provides a scientific justification for their inclusion. You should also identify alternative methodologies and outline the reasons why they were deemed inappropriate.

			YES	NO	N/A
11.	Does your project involve work with animals**? If yes, you should also investigate whether you require approval from the S.A. Health Professions Council and/or related organisation? Provide the answer to this in your proposal**			**X**	
12.	Do participants fall into any of the following groups**? If they do, refer to professional body guidelines and include some reference to these in your proposal.**	Children (under 16 years of age)		**X**	
		Schoolchildren of all ages.		**X**	
		People with learning or communication difficulties		**X**	
		Patients		**X**	
		People in Custody		**X**	
		People engaged in illegal activities (e.g. drug taking)		**X**	

		YES	NO
13.	Does your study include administering a Psychometric test(s)? **If yes, name the test (s) and describe your or your supervisor's competence to administer such tests.**		**X**
		YES	NO

14.	Will your study involve *any* contact with *any* external institution**? If yes, your proposal will not normally be approved unless you submit a letter of confirmation from the person responsible for this institution that they are happy for you to conduct your study on their premises and/or contact their staff and/or people who use the service.**	**X**	

NB: The lead researcher and/or supervisor is obliged to bring to the attention of the Faculty of Business Ethics Committee any ethical issues.

PLEASE TICK **EITHER** Statement **A** OR Statement **B** BELOW **AND PROVIDE THE DETAILS REQUIRED.**

	Please Tick
Statement A: I consider that this project has **NO** significant ethical implications.	**X**

	Please Tick
Statement B: I consider that this project may have ethical implications that should be carefully considered by the Faculty of Business and Management Sciences Ethics Committee, as it deals with ethically sensitive issues e.g. research involving vulnerable populations. **If you select this statement ensure that you provide the methods and/or evidence that will address the ethical issues in your proposal, and furthermore that you are willing to avail yourself for an oral presentation of your study to the ethics committee.**	

If you ticked Statement B you must provide all the information listed:

1. Your name and title of project
2. Purpose of project and its academic/scientific rationale.
3. **Full** description of methods and measurements
4. Participants: recruitment methods, number, age, exclusion/inclusion criteria
5. Consent and participant information arrangements, debriefing. **Please attach intended information and consent forms.**
6. A clear but concise statement of the ethical considerations raised by the project and how you intend to deal with them.
7. Estimated start date and duration of project.

This form (and any attachments) must be submitted to the Faculty of Business Ethics Committee where it will be considered. **If any of the above information is missing, your application will be returned to you.**

I understand the Cape Peninsula University of Technology Guide to Post Graduate Studies and Guidelines for Research Proposals and to the best of my knowledge have complied with the ethical requirements for research.

Lead Researcher

Signed:

Print Name:

Date:

Supervisor
Signed:
Print Name
Staff Number
Date

Appendix E: Consent form

Faculty of Business and Management Sciences

Ethics Informed Consent Form

CONSENT TO PARTICIPATE IN A RESEARCH STUDY

Category of Participants (tick as appropriate):

Staff/Workers		*Teachers*		*Parents*		*Lecturers*		*Students*	*X*
Other (specify)									

You are kindly invited to participate in a research study being conducted by [name of student] from the Cape Peninsula University of Technology. The findings of this study will contribute towards (tick as appropriate):

An undergraduate project		*A conference paper*	
An Honours project		*A published journal article*	
A Masters/doctoral thesis	*X*	*A published report*	

Selection criteria
You were selected as a possible participant in this study because you are:

(a) To obtain in-depth understating about the field of the study

(b) Internal Auditors

The information below gives details about the study to help you decide whether you would want to participate.

Title of the research:

Transform Internal auditing into the use of Blockchain Technology, Department of National Treasury

A brief explanation of what the research involves:

The aim is to empower the personnel in treasury for the transformation of internal auditing practice into adopting the Block Chain technology. The objective of the study is to enhance the skills and knowledge of internal auditors about Blockchain. Also to test the methods used in the internal Audit function.

Procedures (*Interview or Self-administer questionnaire otherwise create your own***)**
If you volunteer to participate in this study the following will be done:

1. Describe the main research procedures to you in advance, so that you are informed about what to expect;
2. Treat all interviewees with respect by arriving on time for all the interview schedules and well prepared;
3. Conduct an introduction with the interviewee in order to break ice;
4. All the interviewees will be asked for permission to record the interviews and also take some note where applicable;
5. In a case where there is no clarity, the interviewees will be allowed to ask for confirmation or clarity of words/sentences/phrases to ensure accuracy of the data collected;
6. Participants will be told that their data will be treated with full confidentiality and that, if published, it will not be identifiable as theirs;
7. Participants will be given the option of omitting questions they do not want to answer or feel uncomfortable with;
8. Participants will be told that questions do not pose any realistic risk of distress or discomfort, either physically or psychologically, to them;
9. At the end of each interview all the interviewees will be thanked for their time and information provided for this study;
10. Participants will be debriefed at the end of their participation (i.e. give them a brief explanation of the study).

You are invited to contact the researchers should you have any questions about the research before or during the study. You will be free to withdraw your participation at any time without having to give a reason.

Kindly complete the table below before participating in the research.

Tick the appropriate column		
Statement	Yes	No
1. I understand the purpose of the research.		
2. I understand what the research requires of me.		
3. I volunteer to take part in the research.		
4. I know that I can withdraw at any time.		
5. I understand that there will not be any form of discrimination against me as a result of my participation or non-participation.		

6. Comment:		

Please sign the consent form. You will be given a copy of this form on request.

Signature of participant	Date

Researchers

	Name:	Surname:	Contact details:
1.	Lesego	Assegaai	220042233@mycput.ac.za
2.			
3.			

Contact person:	
Contact number:	Email:

Appendix F: Letter to participants

Cape Peninsula University of Technology

Department of management sciences

Faculty: Internal auditing

Dear Participants:

The objective of this questionnaire is to discover information regarding Transforming internal Auditing into the use and adoption of Blockchain technology to conduct Masters' Thesis (Research) for partial fulfilment of master's degree Internal Auditing at Cape Peninsula University of Technology. The questionnaires are distributed to local government offices, Department of National Treasury at Motheo region in Bloemfontein. The results of the study are expected to contribute and promote to characterize and to transform internal Auditing into the use and adoption of Blockchain technology. The conclusion of the study will be drawn in collective terms without reference at any office or individual respondents. Please do not write you name (personal details) on the questionnaire.

I ensure you that information provided will be strictly treated confidential and only used for the purpose of the research or study

Lesego Assegaai

Email address: 220042233@mycput.ac.za

Appendix G: Interview Schedule

Interview schedule: Blockchain technology and digital transformation (Public Sector)

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07 May 2021

Dear sir/madam

I, Eugine Assegaai am undertaking a master's degree research project entitled '*Transforming internal audit into using Blockchain technology within the Department of National Treasury in Bloemfontein'* is intended to, investigate, if, the solutions offered by Blockchain, technology, can, be, applied, to, the, problems, of, the, Free, State, Provincial, Treasury, Bloemfontein. The researcher seeks your permission to share approximately 10-15 minutes of your valuable time during the questionnaire-based interviews.

Explanatory notes:

1. Your participation in this study is completely **voluntary**. Please **do not** provide your name or contact details.
2. All information given in this questionnaire will be kept strictly **confidential** and **anonymous**. Under no circumstances will other employees or your department have access to the information provided by you.
3. Your responses will be used in an aggregate form with other responses. At no time will your responses or your name be identified in any reports.
4. Please answer **ALL** questions even if you are not completely certain of your response.

Kindly return the questionnaire (if not using online survey) in the postage paid return envelope on or before **05 July 2021**.Summary result of this research project will be used for producing Master thesis which may appear in the Cape Peninsula University of Technology library and research articles in research journals and at conferences.

Should you have any queries regarding this survey, you are welcome to contact the research team.

Ms EL Assegaai
Masters Student-FBMS
Cape Peninsula University of Technology
Cape Town, 8000
South African
Tel: 076 683 0586/ 087 373 0741

Prof J. Dubihlela (PhD)
HOD Internal Auditing & FIS - School of Accounting Sciences
Faculty of Business & Management Sciences
Cape Peninsula University of Technology
Cape Town, 8000
South Africa

Appendix H: Interview questionnaires

Thanks to all participants who agreed to take part in the study.

Internal Audit activity is essential tool to management, The purpose this study is to identify factors that may affect Internal Audit Activity to Transform into the use of Blockchain technology which will be measured in internal auditors' ability, skill, and knowledge about Blockchain and contribution by internal Auditors in public sector.

Kindly you are requested to give response to personal profile, to each statement related with internal auditor's ability, skill, and knowledge about Blockchain technology

1. **Personal profile**

1.1Gender	1.2 Indicate sector
Female	Public Sector
Male	Non-profit organization

1.1 Age

1.2 Age	1.3 Study field	1.4 NQF Level
20-29	Internal Auditing	TVET Certificate
30-39	BCom Accounting	National Diploma
40-49	Management Accounting	Bachelor's Degree
50-60	Economics	Honours Degree
60-above	Other	Master's degree
		Other specify

1.5 Current Position

_____

1.6 Number of Internal auditors in the office

2 How do traditional financial transactions and corporate reporting (accountancy function), differ from financial transactions and corporate reporting (accountancy function) that make use of blockchain technology

2.5 what is the current system is used in internal audit activity?

Name of the system	Comment why this system

2.6 Are there any risks associated with the current system?

X	**Please explain why?**
Yes	
No	

2.7 What systems/method is used for sharing information in internal Audit Activity?

Please explain

2.8 What are the security issues about the current system in Internal Audit activity?

Please explain

2.5 What would you change about the current system used in Internal Audit Activity

Please explain

3 How do traditional internal audit methodologies differ from internal audit methodologies that make use of blockchain technology?

3.1 What are the traditional methodologies used for internal audit engagement processes.

Briefly explain the processes used for internal audit engagement

3.2 Changes would Internal audit activity would make in the organisation?

Briefly explain the changes would be made

4 How can blockchain technology enhance the internal audit function?

4.5 Are you familiar with Blockchain technology?

	X	**Comment**
Yes		
No		

4.6 Does the organisation have any experience with Blockchain Technology contributing to record keeping as management tool?

	X	**Comment**
Yes		
No		

4.3 Blockchain technology is a growing technology, is the organisation willing to test Blockchain technology in Internal Audit Activity?

	X	Comment
Yes		
No		

4.4 If the organisation is to be given workshop/training about Blockchain technology to enhance Internal audit activity would you be willing to participate?

	X	Comment
Yes		
No		

4.5 Is the organisation willing to transform its internal audit activity into the use of Blockchain technology.

Comment

5 What challenges do internal audit functions face in adopting and using blockchain technology?

5.1 If the organisation is to implement Blockchain technology what challenges could the organisation face to implement Blockchain technology? (X) required

Please choose more than one (1)

	X	comment
Budget Priorities		
Lack of leadership and support for innovation		
Knowledge, skills, and capability for implementation		
Resistance/ reject to learn new technology		

Comfortability level- impact of distraction		
Time to adapt and adjust to new technology		
Complexity and disposal of time for training		
If other (please specify)		

5.3 Which statements below replicate organisation's attitudes to the adoption of new technology, such as Blockchain Technology?

	X	**Comment**
Only senior staff may suggest ideas of new technology		
Senior staff are exposed to new technologies.		
Technological change is slow.		
Technology innovation is not a priority.		
If other (please specify)		

5.3 Which department will initiate and implement the use Blockchain Technology in the organisation?

	X	**Comment**
Executives/ Directors		
Information Technology		
Internal Audit		
If other (please specify)		

Teammate system IAA internal audit software

The interview was based in the following aspects:

1. Risks associated with the system and how it contributes to the IAA performance.
2. Low quality and High quantity

3. The current system needs regular update, maintenance, and licence fee.
4. Teammate has limited space, that certain data must be destroyed to create a space.
5. Teammate not all functions operate.
6. Budget issue
7. Teammate is connected to department network.

Appendix I: Declaration of Language Editing

a thesis entitled:

Transforming Internal Audit into using Blockchain Technology within the Department of National Treasury in Bloemfontein by Lesego Assegaai

submitted in fulfilment of the requirements for the degree Master of Internal Auditing in the Faculty of Business and Management Sciences at the Cape Peninsula University Of Technology, District Six Campus, Co-supervisor: Prof J. Dubihlela.

has been subjected to an English language edit by Dr

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1 November 2021