جـــامـعـــة الـــشـرق الأوسـط
MIDDLE EAST UNIVERSITY
Amman - Jordan

The Impact of Blockchain Technology on Internal Audit: A systematic Literature review

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A thesis submitted in the fulfillment of the requirements of a master's degree in accounting

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January, 2023

Authorization

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Acknowledgments

First and foremost, I thank God (Allah), the Almighty for endowing his immense blessing that helped me in each step of my progress toward the successful completion of my research work.

Words cannot express my gratitude to my supervisor, Dr. Ahmad Zuhier Marei for his guidance and support during the research and completion of this thesis.

Thank you to the Middle East University for the opportunities you have given me over the last two years.

Within the University I have also had the support of Dr. Raed Al-Mestarihi, thank you for your helpful advice and support.

Finally, I would like to thank my family to whom I owe a great deal. To my late father and mother thank you for showing me that the key to life is faith, also I thank the one person who has made this all possible has been my wife. She has been a constant source of support and encouragement.

Lastly, thank you all, for your unwavering love and support.
I would have never made it this far without you.

Hasen Aly Chic

Dedication

To my late father and mother

To my wife and children
With love and eternal appreciation

To all of you, I dedicate my thesis.

Hasen Aly Chic

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The Impact of Blockchain Technology on Internal Audit: A systematic Literature review

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Abstract

The study's objective was to determine the impact of blockchain on internal audit using a systematic literature review methodology. In accordance with the study's protocol, searches were made using the terms "blockchain" and "internal audit" in six different search engines: Scopus, Google Scholar, Springer, elsevier, Conferences and Web of Science A total of 88 articles were gathered and presented as the study population. Following the collection process, the researcher applied the inclusion-exclusion criteria to the collected articles, producing a final sample of 19 articles pertaining to the study's objectives. The study produced a number of findings, the most significant of which is that internal audit is impacted by blockchain.

Purpose, authority, and duty, Independence and objectivity, Necessary Professional Skill and Care, and Quality Assurance and Improvement Program were the most often employed standards of internal audit. Additionally, none of the earlier studies on the impact of blockchain technology on internal audit addressed Performance Standards (Managing Internal Audit Activity, Work Nature, Risk Acceptance Notification, Planning Internal Audit Assignment, Report Results, and Workflow Monitoring), demonstrating a gap in the literature.

The most important recommendation is that auditors should be guided by the need to learn more about the technology itself, the effects of risk on the entire organization, changes to workflow and control procedures, the addition of executive and management staff with additional expertise, updates to risk management policies, the addition of a regulatory environment that is rapidly changing, and regulations. These recommendations were made in light of the results that were presented. Furthermore, enticing Blockchain-savvy auditors throughout the employment and selection processes. The study made several recommendations for more research, the most

significant of which was the use of meta-analysis methodology to statistically examine the findings of the current study. Further, broadening the research to incorporate internal audits on blockchain's understudied features.

Keywords: Blockchain, Internal Audit, Systematic Review.

أثر تقنية سلسلة الكتل على التدقيق الداخلي: مراجعة منهجية ادبيه

اعداد: الطالب حسن علي الشيخ

اشراف: الدكتور احمد زهير مرعي

الملخص

هدفت هذه الدراسة الى معرفة اثر blockchain على التدقيق الداخلي باستخدام المراجعة المنهجية للأدب ذو الصلة بموضوع الدراسة. تم إجراء عمليات البحث باستخدام مصطلحات "blockchain" و "التدقيق الداخلي" في ستة محركات بحث مختلفة Scopus , Google Scholar, Springer, elsevier, Conferences and Web of Science تم جمع ما مجموعه 81 مقالة وتقديمها كمجتمع الدراسة. بعد عملية الجمع، قام الباحث بتطبيق معايير التضمين والاستبعاد على المقالات التي تم جمعها، مما أدى إلى إنتاج عينة نهائية من 19 مقالة ذات صلة بأهداف الدراسة. وجدت الدراسة عددًا من النتائج، من أهمها أن التدقيق الداخلي يتأثر blockchain .

(الغرض، السلطة، المسؤولية) و(الاستقلالية ، الموضوعية) و(المهارات المهنية اللازمة والرعاية) و(برنامج ضمان الجودة والتطوير) كانت المبادئ الأكثر استخدامًا للتدقيق الداخلي. بالإضافة إلى ذلك، لم تتناول أي من الدراسات السابقة حول تأثير blockchain على التدقيق الداخلي معايير الأداء (إدارة نشاط التدقيق الداخلي، وطبيعة العمل، وإخطار قبول المخاطر، وتخطيط مهام التدقيق الداخلي، ونتائج التقرير، ومراقبة سير العمل)، مما يدل على وجود فجوة في واضحه في موضوع الدراسة.

اوصت هذه الدراسة انه على المدققين الداخلين ان يكون لهم معرفه تامة بالتكنلوجيا وخاصة blockchain ، ، بالاضافة الى اختيار مدققين ذو خبر وكفاءة عالية بتقنية blockchain . جاءت هذه التوصيات في ضوء النتائج التي تم عرضها. بالإضافة إلى اهمية اختيار المدققين المتمرسين في blockchain خلال عمليات التوظيف. قدمت الدراسة عدة توصيات لمزيد من البحث، كان من أهمها استخدام منهجية التحليل الاحصائي لفحص نتائج الدراسة الحالية. بالإضافة إلى ذلك، قم ضرورة دراسة ميزات blockchain غير المدروسة مع التدقيق الداخلي.

الكلمات الرئيسية : blockchain ، التدقيق الداخلي، المراجعة المنهجية الادبية

Chapter One
Background of the study

Chapter One

Background of the study

1.1 Introduction

Risks are introduced by the emergence of new disruptive technologies in the form of numerous interconnections and exposures (Popchev, Radeva & Velichkova, 2021). While still ensuring connectivity, interoperability, and data migration, they can nevertheless develop entirely new business models (Filipova, 2018). For internal auditors, these advancements have produced unique obstacles (Cetinoglu, 2021). Internal audit functions need to be upgraded and modified to account for the new relationships, logic, and complexity that arise with the adoption and use of digital technology (Radeva, 2022). For assessing potential benefits or modifying the internal audit process, a thorough understanding of the technological nuances of a blockchain is not required. Understanding the fundamental concepts that are merged and used in this technology is essential, as are the philosophy and new viewpoints. The chosen blockchain implementation platform is also crucial for internal audit and internal control (Popchevet al., 2021).

Regardless of where they are in their business process, the blockchain platform stipulates the technical and financial resources that a corporation needs invest in order to deploy blockchains (Paulsson & Brady, 2022). To build adequate management, risk management, and control from the beginning rather than upgrading them after a problem emerges, auditors should be made aware of the deployment of new technology as soon as is practical (Naim, 2022). Internal auditors are required to actively participate in their own professional development, as well as the search for

and application of various approaches and tools to ensure the functionality and security of blockchain networks, transactions, identification, access methods, and other components related to promising futures and recently discovered risk exposures (Popchevet al., 2021). Although blockchain implementations have the ability to reduce or even eliminate some current internal control vulnerabilities and be used to enhance existing controls, they may also create new risks in the absence of established best practices (Farcane & Deliu, 2020).

Audit is a field of accounting that was created to generate an opinion regarding the accuracy of accounting documents, data, and information (Yoon, 2020). Data is obtained as a result of actions carried out utilizing blockchain technology (Oganda, Lutfiani, Aini, Rahardja & Faturahman, 2020). Internal audit dynamics are changing in tandem with the advancement of technology. This modification has an impact on auditors who undertake internal audits. The approach to internal audit, in particular, has shifted. Internal auditors face numerous threats and possibilities in this situation. The effects of blockchain technology on internal audit become more of a worry given the evolving nature of internal audit (Christ, Eulerich, Krane & Wood, 2021).

The blockchain impact is being discussed as a massive revolution and phenomenon, similar to the World Wide Web in the 1990s. Because of its potential, blockchain has been suggested for use in internal audits to increase trust and transparency. Many research have shown potential solutions and benefits of combining internal audit and blockchain (Popchevet al., 2021; Lee, Fiedler & Mautz, 2018). However, various issues have been raised about whether this new technology will disrupt internal audit or what skills and expertise internal auditors will need to successfully perform their work using blockchain (Huong, 2021). Because auditors will play a crucial role in the

"blockchain - audit revolution," it is critical to include internal auditors' perspectives and understanding of blockchain. So, in this thesis, the researcher will discuss blockchain and its implications for internal audit practice. Additionally, the researcher offer advice on auditing procedures and offer action plans for auditors operating inside the accounting information environment.

1.2 Problem statement

In order to use blockchains, regardless of where in its business process, a company must invest at least the minimal amount of technical and financial resources, according to the blockchain platform. To develop proper management, risk management, and control from the outset rather than to upgrade them after a problem arises, the auditors should be notified of new technology adoption as early as practicable (Popchev, Radeva & Velichkova, 2021). Auditors only have two choices: either adopt this technology and modify their organizational structure and operational procedures, or risk losing the trust of the audit market (Faccia, Al Naqbi & Lootah, 2019). More specifically, because transaction information is readily available, can be traced, and validated via blockchain, auditors no longer manually analyze audit evidence, saving auditors a substantial amount of time (Elommal & Manita, 2022).

The distinctive characteristics of blockchain make it stand out from competing technologies (De Filippi & Hassan, 2018). Information that has been cryptographically encrypted, verified, and confirmed by all users is stored on a blockchain. Therefore, it ought to have a variety of effects on the field (Ducrée, Etzrodt, Gordijn, Gravitt, Bartling, Walshe, & Harrington, 2020). The opportunities and difficulties that the two forms of blockchain could bring for internal and external auditors were also evaluated

by Liu, Wu, and Xu (2019) (permissionless and permissioned). They offer advice for experts on how to use modern technology and grow their company in the list of suggestions they provide at the end of their investigation. From a prospective viewpoint, Desplebin, Lux and Petit (2019) investigated how this technology might affect internal audit.

Few scholars have investigated Blockchain because it is not yet mature enough, thus internal auditing academics Daidj (2022) is only now required to investigate this topic. As a result, the prospects and challenges of Blockchain for the internal auditing profession remain unexplored; there are some empirical evidences, of course, but no systematic review has been conducted (Carlin, Dai, and Vasarhelyi 2017). As a result, there is a scarcity of reviews that synthesize this topic, with current research filling the void. Because Blockchain is still a relatively new field of study, scholars have relied on professional literature, web sources, and publications made by early users of the technology. There haven't been many academic papers to yet on a variety of study themes, and no thorough analysis of the Blockchain literature on internal auditing concerns has been done. But as scholarly interest in Blockchain and its potential societal and economic effects has grown, more and more studies in the field have recently appeared, advancing our knowledge of Blockchain in the internal audit disciplines. The audit and control domains have been ignored by academic study, according to Brender, Gauthier, Morin, and Salihi (2021). To fully address all of the implications of blockchain for the audit profession, there is not yet enough research in this area. The majority of recent research is on how blockchain can be used to improve current audit procedures and processes (Smith, 2018; Liu et al., 2019).

1.3 Research questions

The study's research question is:

1- To what extent have prior studies examined the impact of blockchain on internal audit?
2- What kind of impact would blockchain technology have on internal audit?
3- What are the aspects of each variable (blockchain technology and internal audit) that are most frequently studied?

1.4 Objectives

This study's primary goal is to investigate how blockchain technology may impact internal audit through:

1- Investigating what extent have prior studies examined the impact of blockchain on internal audit.
2- Investigating the impact would blockchain technology have on internal audit.
3- Identifying What are the aspects of each variable (blockchain technology and internal audit) that are most frequently studied

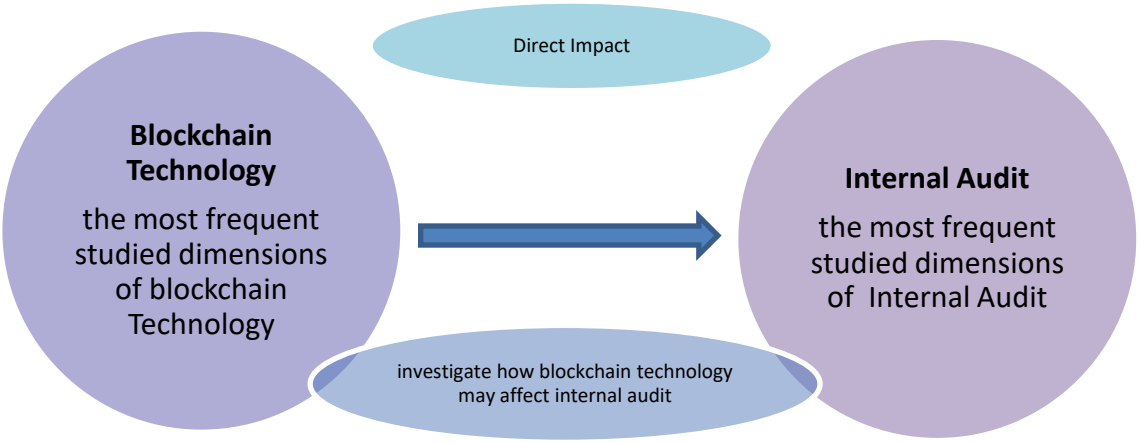

Figure 1-1: Framework of study

1.5 Significance of Study

This study will use a systematic literature analysis and expert reports to examine the growing body of academic research as well as professional publications and websites that address blockchain in the internal audit industry. In order to gather academic papers on blockchain in the context of internal audit, we will perform a comprehensive analysis of academic publications as the first step of this inquiry. The period being considered ranges from 2017 to 2023. Using the terms blockchain and internal audit, which were both used in this literature search, we conducted a Scopus , Google Scholar, Springer, elsevier, Conferences and Web of Science.

Because it provides a thorough, objective, and comprehensive analysis of the body of research on study outcomes, quality, and design in the context of blockchain adoption in the internal auditing profession, this study significantly advances the area of internal

audit. This study also studies and identifies the key issues and pertinent factors, as well as how they affect the adoption of blockchain technology. Furthermore, this study will assist auditors in comprehending the challenges and opportunities associated with utilizing blockchain technology in the internal audit sector.

Moreover, this study aims to explore the connection between blockchain and internal audit as well as the main impact of blockchain on internal auditors. The study will present an overview of emerging themes crucial for future research and practice by looking at and analyzing the most recent academic literature and professional sources.

This study contributes in 3 important ways. In order to provide practitioners, researchers, politicians, and regulators with an overview of this revolutionary technology, it will first systematize blockchain research in the context of internal audit. Second, it will give a general overview of how internal audit procedures may be impacted and changed by blockchain. Third, this study will provide a road map for new research topics and future research directions by combining the body of academic literature with professional data.

1.6 Operational Definitions

Systematic literature review: is a series of procedures that enables researchers to locate, gather, pick, and evaluate studies based on predetermined standards in order to objectively respond to research questions concerning a certain subject (Durach, Kembro & Wieland, 2017).

Blockchain Technology: is the decentralized ledger of all transactions in a peer-to-peer network. Using this system, participants can confirm transactions without a need for a central clearing authority. Oprişan, Dumitrache, and Spînu, 2022).

Internal Audit: is a neutral, impartial assurance and consulting activity that enhances an organization's operations (Mervelito, Lintang & Adri, 2021).

1.7 Limitations

1. Because of the chosen subject, there is a limited amount of studies collected.

2. The studies selected do not cover every facet of internal auditing.

3. There are few research in the globe that use the systematic literature review process

1.8 Delimitations

1. The investigation of blockchain technology's impact on internal audit.

2. Concentrate on the most frequently examined dimensions of each variable (Blockchain and Internal Audit).

3. Scopus, Google Scholar, Springer, elsevier, Conferences and Web of Science were chosen as data collecting engines.

1.9 Thesis Outline

This chapter summarizes the thesis, introduces the concept of Blockchain Technology, Internal auditing, and highlights difficulties addressed in this research.This study introduced Both the Identify reasonable questions -explain, define-inclusion-exclusion criteria -explain, search for studies, select studies, extract data, assess quality and synthesize and present result.

Chapter Two

Theoretical literature and previous studies

Chapter Two
Theoretical literature and previous studies

This chapter will outline the historical development, definitions, significance, advantages, and dimensions of the research variables.

2.1 Blockchain

2.1.1 Blockchain Overview

Blockchain technology is used to keep track of, process, and record financial transaction. The auditing profession could be altered and reshaped as a result. Management professionals and auditors have real-time access to safe information thanks to blockchain technology. The following list summarizes the five core components of the blockchain's operating philosophy. Examples include a request, notice, verification, insertion, and dissemination. It all starts with a user's request to add a transaction to the blockchain. This transaction is made open to the public by alerting all users. During the verification process, users check the transactions. It is then bundled into blocks. The bundled blocks are uploaded to the blockchain in perpetuity.

As a distributed ledger system, blockchain technology is a data structure that uses cryptographic principles to track the movement of transaction money (Wu & Tran, 2018). It uses its own distributed nodes to store, verify, exchange, and transmit network data, making its technical solutions for data recording and interaction safe, dependable, transparent, and traceable. On a blockchain, a transaction's completion triggers a broadcast to all network nodes (Pilkington, 2016). along with transaction

information and a timestamp. Network ledger copies are updated with new blocks, and any conflicts are resolved automatically using preset protocols (Rooney et al., 2017).

As new blocks are introduced, the transactions in a block cannot be changed (creating tamper resistance). When transactions are recorded, a separate hash value is formed, and other blocks related to it cannot confirm the hash value, necessitating network majority consensus. As a result, the contents of any one block cannot be changed retrospectively without affecting all subsequent blocks (Zhang & Shah, 2023). A collection of records that are linked together in a chain and include different types of data. Every node on the blockchain network has access to every transaction in that block as well as all previous blocks, creating a vast transaction database that is continuously updated and accessible to all blockchain users (Pervez, Muneeb, Irfan & Haq, 2018).

2.1.2 Characteristics of Blockchain Technology and benefits

The decentralized design of blockchain has built-in security features that increase the trustworthiness and integrity of transactions (Liu et al. 2019). The purpose of this section is to give a general overview of the blockchain's most salient features as well as its shortcomings.

Decentralization: Blockchain uses a decentralized and distributed ledger to take advantage of all users in the blockchain network's processing capabilities, reducing latency and eliminating the single point of failure, in contrast to centralized architecture, which has problems with single point of failure and scalability (Atlam & Wills, 2019).

Immutability: One of the most important features of the blockchain is its capacity to create immutable ledgers, which upholds transaction integrity. Because databases in conventional centralized designs are vulnerable to manipulation, maintaining data integrity requires building trust with a third party. As long as the network is kept up by the participating user, blockchain technology blocks are permanently recorded and never modified since each block in the distributed ledger is linked to the prior block in a chain of blocks (Atlam, Azad, Alzahrani & Wills, 2020).

Transparency: By disseminating transaction information to all relevant users, blockchain achieves a high level of transparency. The absence of a third party in a blockchain environment encourages business friendliness and offers a trustworthy workflow (Atlam & Wills, 2019).

Real-time: Due to the fact that transactions are recorded and reconciled on the blockchain almost soon after they happen, blockchain technology offers near-real-time transaction records and account reconciliation (Liu et el., 2019).

Smart Contract: Blockchain makes smart contracts possible by including program code. When specific contract requirements are met, these programs can execute transactions and generate the necessary ledger entries. In a decentralized system, self-executing smart contracts allow for the timing of ownership transfers from one party to another (Kaur, Ali & Faisal, 2022).

Better Security: Although security is a concern for most emerging technologies, blockchain is more secure because it has a public key design that guards against unauthorized data alteration. Participants in the blockchain network put their faith in the security and integrity of the consensus mechanism (Atlam & Wills, 2019).

High Energy Consumption: Using energy is necessary to maintain a real-time ledger. A newly generated node simultaneously establishes connections with every other node that already exists. Transparency is gained in this way. Network miners try to solve a huge number of solutions every second in order to validate transactions. There is a lot of computational power being used. Every node guarantees great failure tolerance, zero downtime, and the permanent immutability and censorship resistance of the data stored on the blockchain. But these procedures need both time and electricity (Golosova & Romanovs, 2018).

The blockchain makes it possible to record the transaction as a single event that is verified by the community of minors. This method is especially useful for businesses since it saves them time and significantly reduces human error and fraud by removing the need for them to enter and save the transaction in several databases (Elommal & Manita, 2022).

This technology can undoubtedly give businesses a competitive edge, but it is not without risk since it calls for significant organizational changes, new skills, tools, and working methods that may upset established practices (Elommal & Manita, 2022). The invention of the blockchain is frequently compared to that of the Internet because of its enormous potential to bring about significant changes in a range of industries (Attaran & Gunasekaran, 2019). Blockchain technology will therefore compel businesses to become more innovative and rethink their business strategies or face extinction.

2.1.3 Blockchain Types

Public and private, or "permissioned and permissionless blockchain," are the two types of blockchain that have been identified in the literature. A public blockchain's architecture is open, so anyone can access it and carry out transactions (Olsen, Borit & Syed, 2019). In fact, network members can contribute to the process by accessing or transmitting transactions, according to O'Leary (2017). This particular blockchain is used in Bitcoin, for instance (Smith, 2020).

A register and transactions are made available through the private blockchain architecture, but only to a select group of users. The identification of a transaction's interests and network nodes that permit transaction validation are thus subject to restrictions. Transactions between businesses or those within a group of entities with various affiliates can serve as instances (Elommal & Manita, 2022). According to Smith (2020), this type of blockchain does not require authorization, in contrast to the bitcoin blockchain, giving the organization control over who can join the blockchain and what their privileges are. Singh and Michels (2018) claim that the price declines in the cryptocurrency asset market in 2018 have made it possible to concentrate on the potential of blockchain, particularly on the practical uses for this technology. Smith (2020) asserts that enterprises would be more likely to adopt and trade under the authorized model. This public-private blockchain paradigm is constrained, though. On the basis of the criteria taken into account—which may be either technical or related to system governance—many classifications are in fact accessible.

2.1.4 How does blockchain work

Many historical technologies employed by humanity are incorporated into blockchains. For example, cryptography and payment methods are combined from cryptocurrencies, allowing for secure interactions that are not monitored by third parties. Cryptocurrency also converts the concept of money into an online presence with the capacity to safely trade value via a token. Digital currencies vary from regular fiat currencies in that they are not issued or controlled by the government (Tapscott & Tapscott, 2017). propose six blockchain characteristics:

Each blockchain, including the one used by bit coin, is decentralized and operated on computers donated by volunteers throughout the world; there is no single, vulnerable database. Also, Blockchain is also encrypted: to preserve virtual security, it employs heavy-duty encryption involving public and private keys. Because blockchain is stored on the network rather than within a single institution responsible with monitoring transactions and maintaining records, it is made public, allowing anybody to access it at any time. Bitcoin is more traceable than cash since no one can hide a transaction.

Anyone can use the blockchain. This implies that anyone with a mobile device can engage in the global economy; trusting someone does not require any documentation. Blockchain cannot be changed. In minutes or seconds, each transaction is verified, cleared, and added to a block that is chained with the one before it. Each block must refer to the block before it in order to be valid, avoiding tampering with the ledger. The history of blockchain is extensive. The system uses a distributed ledger to represent the network consensus of all previous transactions.

2.1.5 Types of Blockchain networks

As previously stated, Bitcoin was created to address the shortcomings of centralized networks in payment systems at the time (Nakamoto, 2018). Unlike traditional payment methods, Bitcoin and blockchain allow transactions to take place in a decentralized and distributed network. To have a thorough knowledge of why Bitcoin or blockchain is a solution, it is necessary to first identify and separate the benefits and drawbacks of three network types: centralized, decentralized, and distributed networks.

Types of Network	Pros	Cons
Centralized	▪ Simple to install, develop, and maintain. ▪ Access to the centric server is required.	▪ Security and privacy are at risk. ▪ If the primary server fails, the entire system can fail. It is inconvenient to connect to the main server.
Decentralized	▪ Increase system performance and flexibility. ▪ When the central server fails, the chances of failure are reduced.	▪ Expensive maintenance charges. ▪ Security and privacy risks. ▪ Unstable network performance.
Distributed	▪ Improve network performance and access time. ▪ Provide users with transparency, scalability, and data ownership. ▪ Tolerant of security and failure risks.	▪ Installation is difficult.

Table 2.1 Comparison table between different networks (Hetherington, 2020).

2.1.6 The development of blockchain 1.0 to 3.0

Apparently, the technology behind Bitcoin has gotten a lot of attention since its inception. Blockchain has grown in stages over the last twelve years to become increasingly useful. While the Blockchain 1.0 era - the inception of bitcoin and blockchain technology and its operations - was previously detailed, this chapter will continue to discuss its evolution during Blockchain 2.0 and 3.0 (Wang, Wu, Wang & Shou, 2017).

Few technologies are perfected from the outset, and blockchain is no exception. After seeing that Bitcoin has various drawbacks, such as scalability and unwise mining, Vitalik Buterin vowed to improve the Bitcoin concept by developing an extension to Blockchain 1.0 -a new version that focuses more on currency and transactions. As a result, the Blockchain 2.0 era began with an advanced idea known as smart contracts, or Ethereum (Huong, 2021).

In general, smart contracts and contracts are very similar, with the exception of the "smart" function. A smart contract is a blockchain-programmed contract that converts a contract's human-readable conditions and terms into embedded data that can be used in applications. Grnbaek (2018) In particular, in a buyer-supplier transaction, a smart contract can check and execute on terms and conditions that have been digitally put into the software. When the delivery is confirmed, the funds will be sent automatically from buyer to supplier (Rijanto, 2021). Aside from the accompanying business procedures, blockchain-based smart contracts have a number of advantages for a variety of industries. These advantages include accuracy, real-time transactions, execution risk reduction, and cost savings (zkan, Azizi, & Haass, 2021). It appears that

blockchain-based apps will mostly be built on smart contracts for exchanging data and programming code-triggered agreements. Such applications feature a flexible mechanism that can operate as a blockchain mediator for contracts, information exchange, or simply confirming an individual's legal drinking age (Wang, Zhang & Zhang, 2018). In particular, Ethereum, which was released in 2013, has been widely used as a platform for smart contracts and decentralized apps (Antonopoulos & Wood, 2018).

Blockchain 3.0 was the catalyst for a rapid wave of innovation that expanded the potential of DLT - distributed ledger technology. Despite the fact that smart contracts are built for various schemes rather than its primary goal due to direct codable transactions, blockchain 2.0 revealed numerous drawbacks in the latest distributed ledger technologies (Huong, 2021). The most important ones are:

– Energy consumption: Since mining requires significant energy (electricity) costing billions of dollars per year, it is not scalable to mass adoption.

– Volume of transactions: The number of transactions is increasing every 10-12 seconds with each new block creation. Bitcoin can theoretically process 7 transactions per second while Ethereum processes 15 transactions per second. If we compare the number of transactions to Visas network, which processes 24000 transactions per second, we still need to improve volume of transactions.

– Cost: Since a small fee is required to pay miners for maintaining the ledger, this scheme is only suitable for a limited number of large transactions but not for micro-transactions as it would become prohibitively expensive.

Whereas blockchain 1.0 and blockchain 2.0 propelled DLT to prominence, blockchain 3.0 is said to accelerate DLT's broad adoption. Applications impacted by blockchain era 3.0 are being upgraded and developed to address the constraints of prior era blockchain. (Huong, 2021). Poor scalability due to insufficient energy usage during mining, lack of interoperability between different varieties of blockchain, and privacy are examples of such restrictions (Kapassa, Themistocleous, Christodoulou, & Iosif, 2021).

2.2 Internal Audit

2.2.1 Internal Audit: An Historical Perspective

The demand for internal audit is driven by the requirement for some sort of unbiased verification to reduce record-keeping errors, asset misappropriation, and fraud within businesses and non-profit organizations (Gezahegn, 2020).

a. help others understand the purpose, range, effectiveness, and goals of internal audit.
b. Globally standardize internal audits.
c. Promote better internal audit.
d. Establish the foundation for regular internal auditing procedure measurement.
e. Give internal audit the tools it needs to be fully recognized as a profession.

Internal audit was defined and objectively stated in the Standards as follows: "Internal audit is an independent appraisal activity established within an organization as a service to the organization." It is a control that assesses the sufficiency and

effectiveness of other controls. The purpose of internal audit is to help team members properly fulfill their commitments (Axmedjanov, 2020).

The fundamental steps of an operational audit had by this point been established as follows: conduct a preliminary survey; develop the audit program; conduct fieldwork; prepare working papers; develop a list and prioritize findings; communicate findings with those being audited; and, finally, prepare and present the audit report. Internal audit work engagements were evaluated for quality using the Standards and the Statements on Internal Audit Standards (SIAS) (Mcintyre, Scofiel & Trammell, 2019).

It was well known by the early 1990s that internal auditors performed a variety of tasks, depending on the requirements and preferences of their particular organization, including compliance audits, audits of transaction cycles, investigations into fraud and other irregularities, assessments of operational efficiency, analysis, measurement, and reporting of operational and organizational-wide risks, and other assurance and consulting tasks (Mamaile, 2018). They performed operational reviews and audits, management audits, compliance audits, and financial reviews and audits (also known as program audits, performance audits, comprehensive audits, and other similar descriptive phrases). Many of these operations were approached by internal auditors using a risk-based and controls-focused methodology. They also heavily utilised advanced digital tools when conducting audits (Boskou, Kirkos & Spathis, 2019).

As a result, internal audit, in accordance with ICAEW (2000), has two main purposes. While internal audit's second role is to advise management on risk management and controls, audit's first role is to give assurance to the administration, audit committee, and management. It also provides guidance on how to assess the effectiveness of corporate management, risk management, and control processes created by

management. In light of the aforementioned, internal audit might be described as a risk management position as opposed to an impartial evaluation one. Instead, it is now an essential prerequisite for any company (Alqaraleh, 2019), as its independent, unbiased assurance and consulting operations help organizations grow (Newman & Comfort, 2018).

Internal audit evaluates the management process and then makes the fitting recommendations for improvement through the accomplishment of the objectives as laid down by the Institute of Internal Auditors Jordan (2019) as follows:

- To support the acceptable ethical principles and values inside the organization.
- To ascertain efficient management performance and establish an accountabilities system within the firm.
- To effectively transferred the information regarding risks and control the applicable policies of the firm.
- To effectively coordinate various activities and transferred the correct information to board members, external and internal auditors, and management.

According to Ali and Handayani (2018), an efficient internal audit process helps management devise numerous strategies for achieving organizational goals. Internal auditing offers organized, controlled review processes and boosts the effectiveness and performance of the company. The internal audit department is crucial since it is essential to the operation of accounting systems, which in turn helps in the evaluation of the department's performance, claim Balkat and Khaleel (2021). The internal audit also keeps track of all businesses involved in the sector, making it the primary component of business accounting. Additionally, because financial reports represent

the caliber of the internal audit department, the efficiency of internal audit supports the growth of the business' operations. Similar to this, internal audit is a crucial part of the corporate governance framework for businesses. In order to assure the accuracy of the financial reporting process, corporate governance also involves the board of directors' and audit committees' oversight functions (Alqaraleh, 2019).

2.2.1.1 The Scope of Internal Audit

Nothing will stay the same in today's corporate environment for long. As a result, it is critical that internal audit be expanded beyond accounting and finance. Indeed, when the business volume reaches a level that requires management work analysis, internal audit operations must also encompass other areas in the organization such as commercial, technical, and production. As a result, in addition to ensuring that the books include accurate facts, internal auditors evaluate guidelines, policies, processes, management quality, method effectiveness, and other functions (Nedyalkova, P. (2020).

Eton, Murezi, Fabian, and Benard (2019) found that there is a need to develop a comprehensive plan to implement and enforce internal audit activities in Kabale District, Uganda. Internal audit planning entail's goal definition, activity schedule development, staff and budget planning, and activity reporting. Relevantly, in order for the internal audit plan to be in line with corporate objectives, internal audit planning must take risk into consideration. According to Ali and Handayani (2018), the strategy should contain an evaluation of the organization's primary risk management procedures as well as a list of the most important hazards that were discovered through the procedures. Activities that will be most affected by existing or anticipated changes

should also be examined. Furthermore, as stated in Paksoy, alik, Yildizbaşi, and Huber, S. (2019), the recommended plan should be flexible enough to allow for rectification during the year due to changes in management strategy, revised expectations of firm objectives fulfillment, external conditions, and so on.

Carreras Guzman, Wied, Kozine, and Lundteigen are some of the players (2020) Chaudhary and Shah (2016) agreed that internal audit might monitor the system, process, or operations without ignoring the boundaries between corporate constituents, which commonly limit other entities involved in the study, especially in terms of job scope.

2.2.1.2 The Responsibilities of Internal Audit

In terms of accountability, internal auditors are comparable to consultants because they are likewise tasked with providing technical guidance during decision-making. Additionally, it is believed that internal auditors are tasked with providing suggestions for the improvement of potential or weak points in an organizational structure. Egels-Zandén (2017) asserts that management choose whether to accept (or reject) various solutions in crucial and challenging circumstances.

It's important to note that management, not the internal auditor, is responsible for assessing the inherent risks that firms face. In fact, auditors simply give management and the audit committee comfort regarding the effectiveness and efficiency of the process. This is in line with Ali's (2016) assertion that internal controls continue to be efficient and perform as intended, despite the fact that management is naturally accountable for assessing intrinsic risks. As instructed by management, internal controls also accurately identify the importance of risk. Modern auditors are

increasingly concentrating on company procedures and systems rather than transactions, claim Werner, Wiese, and Maas (2021).

A number of stakeholders and stockholders, including low-level management, senior management, shareholders, the chief executive, directors of finance, the board of directors, employees, and the external auditor, use the financial report of the internal auditor. Internal auditors must therefore conduct themselves professionally because their reports contain crucial data for attaining the intended goals. They must also establish relationships with management (Handoyo & Bayunitri, 2021).

Additionally, internal auditors must constantly improve and update the knowledge they have already attained because the report they produce is not final nor the only result of their efforts. By offering pertinent guidance on anticipated future hazards in particular firm domains, Alqaraleh (2019) highlighted the need of internal audit concentrating on future operations. In this way, the CEO will get administrative (i.e., day-to-day operations) reports from the Chief Internal Audit Executive and the Board of Directors, respectively (IIA, 2013). Internal audit performance and methods, according to Kahyaoglu and Caliyurt (2018), include assurance and direction, suggestion of actions to management (action), help in improvement and execution (assurance).

As a result, the internal auditor is in charge of managing all business operations. Mwape (2022) emphasizes the importance of internal auditors developing a thorough awareness of corporate management as well as its impacts on business operations, particularly those related to management and control.

2.2.1.3 The Role of Internal Audit

Internal auditors provide numerous functions inside the organization. Table 2.1 summarizes the functions based on literature reviews:

Table 2.2: Roles of Internal Auditors

Roles	Functions	Source
Technical	Auditor competency can help an organization's controls risks and internal monitoring.	(Mokhitli & Kyobe, 2019)
Decision Support	Assisting management in identifying, evaluating, and mitigating risks that may harm a process.	(Baryannis, Validi, Dani & Antoniou, 2019)
Communication	Attend to management expectations at several levels for specific activities.	(Mokhitli & Kyobe, 2019)
System Involvement	The system's current input is appropriately documented.	(Baryannis, Validi, Dani & Antoniou, 2019)
Assurance Services to the administration	Evaluate the efficiency of the management's developed corporate management, risk management, and control procedures.	(Ljubisavljević & Jovanović, 2011)
Governance	Evaluate and propose appropriate proposals to strengthen the governance process.	(Alqaraleh, 2019)
Risk Management Support	Risk management for the board of directors and management, or for the internal audit committee	(Larasati, Ratri, Nasih & Harymawan, 2019)
Control Oversight	Aid in enhancing internal control of a corporation.	(Aziz, Ab Rahman, Alam & Said, 2015)
Consulting Services	Provide management with risk management and control consulting services.	(Ljubisavljević & Jovanović, 2011)
Management Intimidation	Provide a warning to the audience if they violate the sovereignty of a profession.	(Alqaraleh, 2019)
mechanism of control	Intervene in critical situations to defend all users' interests.	(Răvaș & Dăneț, 2019)
Fraud disclosure and control	Method for improving financial statement fraud control.	(Handoyo & Bayunitri, 2021)

2.2.1.4 Internal audit standards

The Institute of Internal Auditors (IIA) officially accepted the Standards for the Professional Practice of Internal Audit (Standards) in 1978, and they fulfilled the following purposes (Calvin, Eulerich, & Lopez-Kasper, 2021):

a. Help others understand the function, parameters, results, and goals of internal auditing.
b. Harmonize internal auditing globally.
c. Promote better internal audits.
d. Create a foundation for reliable internal auditing operations measurement.
e. Provide a means for full professional recognition of internal audit.

While The International Standards for the Professional Practice of Internal Audit (ISPPIA) highlights the importance of the IA team and stresses the requirement for them to have the knowledge, skills, and other competencies necessary to carry out their obligations (Singh, Ravindran, Ganesan, Abbasi & Haron, 2021). The primary studies we have examined (Turetken, Jethefer, and Ozkan 2020; Plant, Barac, and Sarens 2019; Chang, Chen, Cheng, and Chi 2019) relate the competencies with the experience of the staff members, their professional qualification, percentage of certified staff, training hours, and educational level. These studies used questionnaires to collect information on the internal auditor's competencies, including how long employees had worked for the organization and how many certificates and trainings they had recently completed (Nurdiono & Gamayuni, 2018).

A competent internal auditor also follows accepted industry standards (Turetken, Jethefer & Ozkan, 2020). Studies have pointed to the IIA standards' observance as a

deciding factor. According to the IIA standard, internal auditors must uphold IA objectivity, competence, and professional care (Dejnaronk, Little, Mujtaba, & McClelland, 2016). The literature also covers using the ISO 19011:2016 standard as a guide for performing audit duties (Turetken et al., 2020).

The benchmarks by which the performance of the internal audit department should be evaluated were also stated in the Standards (Moffitt, Rozario & Vasarhelyi, 2018). They talked on a range of organizational internal audit issues, such as independence, professionalism, scope of work, the effectiveness of audit tasks, and management of the internal audit department (Islam & Bhuiyan, 2021). Interpretations of the standards are found in Statements on Internal Audit Standards (SIAS), some of which concentrate on specific control concepts, risk assessment, preventing and detecting fraud, cooperating with independent auditors, speaking with the board of directors, assignment planning, and following up on audit findings (Wolde, 2016).

The chief audit executive must establish a follow-up procedure in accordance with the IA performance standard (IIA, 2017) to monitor previously identified internal control weaknesses and verify that management actions have been successfully carried out or that senior management has agreed to accept the risk of doing nothing. According to studies in the literature, the IAF will function more effectively if there is a process in place for monitoring the status of audit results and recommendations (Oussii & Taktak, 2018).

The Institute of Internal Audit has classified the standards of the profession into the following (IIA, 2017):

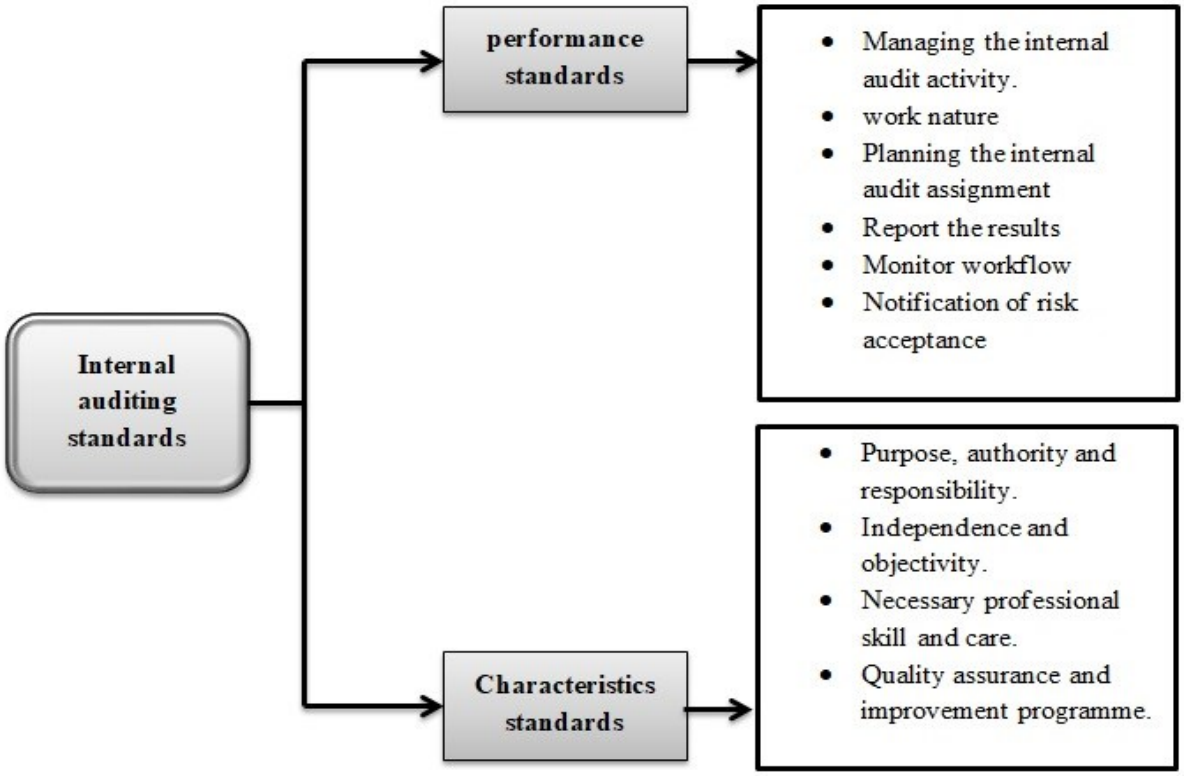

Figure 2.1 Internal audit standards

2.2.2 Internal Audit Basics and Perspectives

The definition of an audit is "Professional study and verification of a company's financial records and related data with the goal of expressing an opinion as to their fairness, consistency, and conformity with widely accepted accounting principles." "An employee of a firm who checks records and procedures to ensure against fraud and to ensure that board directives and management policies are being effectively performed," according to the definition of internal auditor. Internal control is described as "a process, procedure, or system aimed to promote efficiency, ensure the application

of policy, and safeguard assets" in the Dictionary of Finance and Investment Terms (Popchev, Radeva & Velichkova, 2021).

According to The IIA's International Professional Practices Framework, internal auditing is "an independent, objective assurance and consulting activity intended to provide value and enhance an organization's operations" (IPPF). It helps a firm achieve its objectives by using a methodical, disciplined approach to assess and improve the effectiveness of risk management, control, and governance systems (Mocanu & Ciurea, 2019).

Additionally, the internal audit function helps to create a successful system for risk reduction and management and offers IC neutral and objective procedures (Aksoy & Salam, 2020). The internal control, on the other hand, is a method employed by the company to guarantee the security, safety, and integrity of sensitive data, including financial and accounting information. Additionally, internal control should ensure that tactical, strategic, operational, and financial objectives are consistently and methodically achieved (Faccia & Petratos, 2021).

2.2.3 Accounting information systems for internal Auditors

Increasing security is the main goal of traditional accounting information systems. The gathering and reporting of financial data is covered by this security. Internal auditors typically draw attention to the issue of delayed information delivery, or the lack of timely availability of information. Internal accounting expends a lot of effort to validate and clean up the data (Smith, 2018).

Internal auditors should concentrate on the new risks and opportunities that blockchain technologies bring. Business goals are established by blockchain technology (Tuek,

Jeovita, and Halar, 2021). Internal auditors should assess internal and external risks in relation to these business objectives, just like they would with any new technology. Internal auditors should check whether the proper steps are being taken, such as staffing and timelines, to lessen the risks to their clients. The security mechanisms used by blockchain technology are unique (Hayrettin & Karaburun, 2020). Internal auditors ought to test the system, nevertheless. In the blockchain, millions of transactions are being written at once. Internal auditors should handle the quick and prompt collecting of data in the interim. Since the design phase, availability risks should not be disregarded. It is important to assess the security of the authorizations given to users in terms of confidentiality risks (Abdennadher, Grassa, Abdulla & Alfalasi, 2021).

It is believed that internal auditors will be receptive to blockchain technology. They need to be aware of the advantages and dangers this new technology will present. Future damaging developments should be anticipated by auditors (Karahan & Tüfekci, 2019). Professionals in internal auditing will want to use innovative techniques and equipment. mainly because they will have to check the feasibility and structure of blockchain networks. Additionally, they must evaluate the suitability and efficacy of risk mitigation measures related to blockchain transactions (Kloch & Little, 2019).

2.3 Blockchain and Audit

2.3.1 Blockchain in Internal Audit

The blockchain has consistency. Activities related to audit preparation and manual data extraction are eliminated with uniformity (Mahbod & Hinton, 2019). By planning and carrying out audit duties, auditors guarantee the accuracy of the data. For the purpose of determining if there are material misstatements, the auditor gathers sufficient and pertinent evidence (Appelbaum & Nehmer, 2017).

Evidence that can be believed and validated by the auditor is said to be reliable. The audit team forms an opinion after gathering and analyzing enough audit information. All of the data that the auditor used to form his or her audit opinion serves as audit evidence. There are internal and external sources of evidence (Appelbaum & Nehmer, 2017).

Traditional auditing cannot exist without confirmations. For the information saved and analyzed on the blockchain, this procedure won't be necessary (Smith, 2018). Information that is encrypted and authenticated via blockchain technology is automatically cleaned and categorized (Smith, 2018). However, the integrity of the data may be jeopardized by defects or implanted codes. In order to ascertain this condition, auditors wish to assess the client's practices. Oracles are unofficial sources of knowledge. They ought to be rationally connected to smart contracts in the appropriate way. The physical control of Internet of Things devices should be examined by auditors (Sheldon,2019).

The auditor must physically verify the initiating event if the initial entry or source of the chain is questionable. Through verification, observation, and recalculations-

performance, this physical validation is accomplished (Appelbaum & Nehmer, 2017). The auditor can manually investigate noteworthy things. A follow-up smart audit technique for records that need more inquiry can be pre-programmed (Rozario & Thomas, 2019).

2.3.2 The benefits of applying blockchain to internal audit

Blockchain, best known for its application in the Bitcoin cryptocurrency, has developed to become a component of the technological ecosystem in fields like robotics, AI, and the Internet of Things (Singh, Rathore & Park, 2020). This was referred to by Deloitte as "the technical backbone of future commerce," and it was expected that blockchain will improve company processes and economic sustainability (Chae, 2019). Accordingly, PwC said that blockchain is the "next-generation business process improvement software to structurally transform shared behaviors between customers, rivals, and suppliers" (PwC, 2018).

In the traditional situations, auditors examine corroboration from sources outside of the company, such as bank statements, to corroborate claimed transactions. Typically, these procedures take a month or longer to produce results (Ozlanski, Negangard & Fay, 2020). With blockchain, the open, immutable distributed ledger can be used to verify all transactional data. With the capacity to test transactions without restrictions, blockchain not only saves money and time but also raises the level of audit assurance (Huong, 2021).

2.3.4 Audit Evidence in Audit Blockchain

A variety of sources are used to gather and store audit evidence. With blockchain, auditors can avoid having to mix financial and non-financial data. The auditor extracts audit evidence from the client's blockchain. The hash of smart audit procedures receives this data. Finally, the smart audit method executes the previously established audit test (Rozario & Thomas, 2019).

Blockchain transaction data is excellent audit proof. since it has been established that transactions only occur once. The auditor merely needs to obtain the pertinent transactional data from the blockchain in order to verify the accounts. They follow that with analytical processes (Wang & Kogan, 2018). Once a block of transactions has been finished and added to the blockchain, it cannot be undone. A tamper-resistant audit trail is given to the auditor thanks to encryption and decentralization capabilities. These qualities increase both internal and external data's dependability (Rozario & Thomas, 2019). The efficiency of the information acquired from the blockchain will rise with the number of entities who embrace it (Mahbod & Hinton, 2019).

It is advised to use systems that guarantee data privacy. These schemes have the capacity for centralization and are run by a reliable third-party auditor. The security of the auditing protocol is compromised as a result of centralization. Instead, a plan that encourages decentralized auditing is put out (Fan, Bao, Liu, Vasilakos & Shi, 2020).

The auditor is relieved of the observation effort thanks to the proof offered by a continuous real-time audit. The timestamp of each transaction added to the block is all that auditors need to look at. They can also determine whether block lengths lengthen over time (Appelbaum & Nehmer, 2017). However, auditors should think about the

dangers before developing techniques to directly access audit data. The possibility that the data may be erroneous owing to a mistake or fraud comes first among these dangers (Mahbod & Hinton, 2019).

2.3.5 Threats and Opportunities in Audit Blockchain

Blockchain auditing has both risks and potential. The digitalization process results in a great level of transparency. Auditor pushback from clients is thus a possibility (Tiberius & Hirth, 2019). Fraudsters may try to take over or rewrite the blockchain of peer nodes that are connected to the same cloud. The auditor should take this extra risk into account (Appelbaum & Nehmer, 2017).

In the world of technology, changes take place swiftly. The blockchain technology has also changed the hazards to customers. For auditors, the capacity to address these developments and dangers is viewed as a chance (Rozario & Thomas, 2019). Auditor possibilities will arise from the routines of audits and their proximity to real time. Concentrating on difficult and hazardous deals is one of these opportunities (Mahbod & Hinton, 2019).

Audit components include confirmations, inventory counts, and data analysis. Prior to the blockchain, confirmations were random. After blockchain technology, confirmations have become 100% real-time. In the pre-blockchain era, inventory counting was done manually; in the post-blockchain era, it was done continually. The topic of data analysis is then covered. While pre-blockchain uses sampling methodology, post-blockchain uses continuous data collection and uses all available information (Smith, 2018).

The audit workload is decreased by incorporating blockchain technology into company procedures. The opportunity to concentrate on other operations allows auditors to do so (Karahan & Tüfekci, 2019). Because of its impartial, open access infrastructure and lack of corporate or individual ownership, Ethereum is an operating system (Ethereum, 2020). A consensus feature exists in Ethereum. Consequently, the auditing procedure is more transparent and secure than the conventional auditing methodology (Fan, Bao, Liu, Vasilakos & Shi, 2020).

The key characteristics of blockchain are decentralization, immutability, and accountability. Decentralization makes it less likely for fraud to happen on the blockchain. The cryptographic technique being used achieves immutability. Accountability is established by the auditor confirming the transaction's origin by using the user's digital signature (Rozario & Thomas, 2019). Blockchain technology can open up new options for the audit profession even as it eliminates the necessity for present auditors (Demirkan, Demirkan & McKee, 2020).

2.3.6 Effects of Blockchain Technology on Internal Audit Profession

Auditors are individuals who carry out audit work and make a living doing so. In an accounting audit application, there are three separate audits of auditors. These include public, internal, and external auditors (Usul, 2015). Since internal auditors are the focus of this study, it will be thoroughly scrutinized.

The accounting industry is undergoing a shift as a result of technology advancements (Smith, 2018). With blockchain, auditors may be more creative and effective (Mar, 2018). While automating audit work, intelligent audit procedures give auditors the chance to enhance internal audit quality (Rozario & Thomas, 2019).

The fact that every transaction carried out using this technology gets as authentically attested as a notary public account for the high level of trust in the data gained from it. The function of auditors is critical and crucial. The first transaction with the object under consideration should be authenticated by auditors. All following transactions will be regarded as successful and trustworthy (Melnychenko & Hartinger, 2017).

2.3.7 Blockchain Technology Drove the Role of Internal Audit Forum (IAF)

Internal audit is an unbiased monitoring and assessment activity focused on the company's internal economic activities and assisting the management department, claim Nazarova, Mysiuk, Gordopolov, Koval, and Danilevien (2020). It also contributes to the inspection, monitoring, and evaluation of the assets' safety as well as the operation of the firm itself. The accuracy, completeness, and legality of the company's accounting information are also under its watch (Chowdhury & Shil, 2019). Numerous organizations have gotten larger and more complex in terms of their fiduciary and responsibility ties as the market economy has expanded. Due to considerable changes in the content and primary structure, a wide range of internal audit services and service targets have changed. Internal audits are conducted at many different levels, from management to the business, with the goal of improving governance, risk management, and control systems. Internal audit operations that are in line with each organization's goals and values will be the most effective. Every organization will have different senior management and audit committee expectations for the internal audit job (Pitt, 2021).

Blockchain technology has not yet had a substantial influence on internal audits (Lombardi, de Villiers, Moscariello & Pizzo, 2021). In a world where new technologies, like blockchain advancements, are thriving but standards are lagging, the function of internal audit needs to be continuously developed to include the capability to verify the regular operation of the various components of the blockchain, which provides for verification of access rights, encryption, and encryption codes, as well as proof of smart contract transaction codes, functions, and security (Gauthier & Brender, 2021). Little and Kloch (2019). Internal audits will therefore need to create procedures for evaluating how efficiently blockchain systems are running.

Auditors might consider using relevant data analytics in blockchain and expanding consultation services like control design, change management, and blockchain governance with resources freed up from traditional evidence gathering and testing (Liu et al., 2019). Blockchain technology has altered the internal audit function, prompting the creation of a conceptual framework to picture the function of internal audit. Internal auditors will also need to build relevant monitoring methods and refresh their understanding of the internal and external risks related to blockchain activities.

2.3.8 Continuous Auditing with Blockchain Smart Contract

Blockchain has a lot of potential as a tamper-proof audit trail because of its encryption and consensus processes, which ensure transaction integrity. Smart contracts can be utilized on the blockchain for a number of things, including the safe transfer of property titles and the automatic settlement of financial derivatives (Simoyama, Grigg, Bueno & Oliveira, 2017). When combined with smart contracts,

which are computer programs that perform tasks on behalf of a user, blockchain technology has the power to drastically transform current business procedures Szabo (2019). If a financial institution's database architecture is a blockchain platform, blockchain-enabled smart contracts can establish adaptable supply chains and financial organizations by automatically monitoring and carrying out the terms of bills of lading and financial derivatives (Rozario & Vasarhelyi, 2018). Then, a variety of company functions, including internal audits, are realized using blockchain smart contracts in accordance with the encryption and consensus mechanism. Therefore, internal audit obligations for financial institutions can be modeled using blockchain technology (Zhang & Shah, 2023).

Continuous auditing was developed by Kogan, Mayhew, and Vasarhelyi (2019), and continuous control monitoring was implemented. Constant data assurance, continuous risk monitoring and evaluation, and continuous auditing are further management system options (Rozario and Vasarhelyi, 2018). Internal audits are frequently equated with continuous auditing since they are less constrained by regulatory constraints. Rozario and Vasarhelyi (2018) claim that audit data analysis is a logical next step. ADA3.0 blockchain smart contracts. Fundamentally, the blockchain platform enables the development of intelligent audit processes that instantly supply audit data, perform prediction models, and flag critical things. The gap in expectations between stakeholders and auditors can be reduced and audit quality can be increased using smart auditing models (Rozario and Vasarhelyi, 2018).

2.4 Previous Studies

Blockchain has piqued the interest of scholars in a variety of disciplines, including banking, marketing, supply chain, etc., in recent years. To our knowledge, few research have examined its use in auditing. While there have been financial industry reflections on the blockchain, according to Brender, Gauthier, Morin and Salihi (2021), academic research has disregarded the audit and control domains. There is yet not enough research in this field to address all the implications of blockchain for the audit profession. The majority of recent research focuses on blockchain's applicability to audit processes and capacity to enhance present audit practices (Smith, 2018; Liu et al., 2019).

The audit ecosystem may change as a result of blockchain technology in order to improve transparency, real-time work, and verification, according to Dai and Vasarhelyi's (2017) discussion. They think that when we use the blockchain to create an autonomous insurance system, the current auditing processes will alter and become quicker and more accurate. Smart contracts built on blockchain technology can be used to keep accounting data safely, rapidly communicate important details to interested parties, and increase the accuracy of company data. New accounting information systems can be developed for firms to record transactions that have been confirmed on secure registers.

Since no actual studies have been conducted on the blockchain or the audit, all of these studies are theoretical in nature. The lack of research into this technology appears to be due to both its complexity and limited use. In reality, Smith (2018) points

out that the use of blockchains in business operations by accounting firms has only recently started to be explored, developed, and implemented.

The principles of blockchain technology and how it influenced accounting and auditing were also covered by Bansal, Batra, and Jain (2018). In addition to creating a new platform to restructure the business world and transform the accounting and auditing profession, they asserted that these new technological transaction tools offer the greatest potential for change in various accounting procedures. One should not undervalue its potential influence on the accounting industry. The emergence of computers, ERP systems, and cloud computing are examples of earlier developments that have affected the auditing profession rather than making it obsolete. The strategy that auditors will need to take will need to be more data-centric and future-oriented.

According to study by Dai, He, and Yu, the usage of blockchain and smart contracts may lead to the emergence of a new generation of audit, dubbed as Audit 4.0. (2019). They suggest a framework that outlines the applications of blockchain technology and smart contracts in order to aid in the implementation of Audit 4.0. They demonstrate how these technologies can be utilized to address two concerns that are essential for the adoption of Audit 4.0: data integrity and the efficient operation of intelligent audit modules. They also demonstrate how these technologies can be leveraged to put up continuing, real-time audits, helping to establish a 4.0 audit.

Sheldon (2019) offers new areas of interest for ITGCs (General Information Technology Controls) for auditors as well as risk categories that the blockchain may reduce. The importance of being cautious among blockchain users, including businesses, auditors, and regulators, is stressed by this author. The ITGC's assistance and proper operation are required for the blocking chain to transmit trustworthy data

because it is still a part of an IT infrastructure (AICPA and CPA Canada 2017). Users who base decisions on this data should have a solid understanding of how it is controlled, queried, and extracted, especially auditors who can use blockchain extracts.

Rozario and Thomas (2019) also examined the potential impact of smart contracts and blockchain technology on the paradigm of financial statement auditing. The authors attempted to sketch out a conceptual framework for an external audit blockchain in which intelligent audit processes (a sort of smart contract) can carry out audit programs on their own and expose audit results to diverse users practically immediately. By using both financial and non-financial data, they showed how the audit blockchain may improve audit quality and bridge the expectation gap between auditors, financial users, and regulators.

Additionally, according to Bizarro, Garcia, and Moore (2019), future accounting and auditing services will almost probably take blockchain into consideration. They also emphasized that the blockchain is an opportunity rather than a danger. They discussed a few of the commercial items that make an effort to use blockchain technology. Additionally, they described some of the products that are now on the market that attempt to include blockchain technology. Blockchain is still very young, and software development is quite active.

Additionally, blockchain auditing can be used to replace third-party auditing services, providing "self-auditing" that is more dependable and secure, claim Tapscott and Tapscott (2019). Each participating node in the blockchain distributed ledger network performs the roles of an auditor and a data keeper. Compared to outside auditors, the blockchain ledger can guarantee the impartiality, objectivity, and independence of auditing work, and the information stored by firms on their own blockchain financial

system can guarantee the objectivity and correctness of financial reporting. Data auditing benefits from decentralized auditing techniques are substantial. Zhong and Jia also looked at blockchain from the perspective of data reliability (2018). The findings suggest that the properties of blockchain and the benefits of big data may be used to particularly solve the problem of data silos by evaluating the common problems with conventional Internet banking. Blockchain technology can be used to improve accounting data structures and meet social demands for the legitimacy and accuracy of online finance.

To better understand how smart contracts and blockchain interact, Smith (2018) looked at how these applications can change the auditing process. He contends that for the blockchain to function effectively and efficiently, it must interact with other platforms and be linked to the existing technology systems. Smart contracts make it possible for the blockchain to connect to other technical systems and modify blockchain platforms at the business level.

By looking at blockchain from a fresh perspective, Yun, Goh, and Chung (2020) argue that it has an audit system that will transform the accounting sector. Blockchain information writing is an automated audit of accounting transactions, review, confirmation, bookkeeping, and other bookkeeping activities in which participants jointly confirm whether the accounts are true and complete in order to lessen fraud and satisfy stakeholders' needs for accurate and authentic financial data.

Due to its distinct distributed ledger structure, which can achieve the tasks of transparency, sharing, and non-tampering, blockchain is the most efficient technology for data storage and sharing, according to analysis of past studies. Additionally, this technology works nicely with auditing and bookkeeping in accounting. The revolutionary potential of blockchain in the audit industry is progressively coming into

focus as technology is studied and used. Internal audit procedures in the future may assign a sizable portion of labor to smart contracts built on the blockchain. After significant investigation and analysis, scholars today generally agree that blockchain technology offers enormous advantages and has the greatest potential to change audits in the future. To the best of my knowledge, not much research has been done on the application of blockchain technology in the auditing industry; therefore, more research is needed to completely comprehend this technology. The current body of knowledge about internal blockchain audits is grossly deficient.

By reviewing previous studies, the researcher found that there is a clear lack of studies that examined the relationship between of blockchain and internal auditing, in addition to that there is a scarcity of studies that used systematic review, and this in itself made a clear gap in previous studies. Therefore, it is important for future studies to focus on the methodology of systematic review in accounting issues, in particular, the placements of blockchain with internal audit.

2.4.1 What distinguishes the current study from previous studies

The current study differs from past studies in the following ways:

1. Internal audit and blockchain are related in the current study. And assists in settling disagreements over relationships by locating consensus, and resolves the contrast between dimensions by determining the most studied dimensions of each variable.
2. Since it was not done in earlier studies, the systematic literature review approach is employed to examine how blockchain would affect internal audit.
3. This study is the first to employ a systematic literature review as far as the researcher is aware.?

Chapter Three
Research methodology

3-1 Introduction

3-2 What is a systematic review?

3-3 A systematic review: a research option for postgraduate studies

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Chapter Three
Methodology

3.1 Introduction

The idea of conducting a systematic review of the literature will be discussed in this chapter, along with the justification for using this strategy in this thesis. First, a discussion will be held regarding the idea of systematic reviews and why conducting one is a huge learning opportunity. Second, a history of the methods used for systematic reviews will be given. The third step is determining the critical stages of the systematic review procedure.

3.2 What is a systematic review?

A systematic review is described as a literature review that is intended to locate, evaluate, and provide the best evidence related to a certain research issue in order to provide insightful and factual responses (Gopalakrishnan & Ganeshkumar, 2013). This evidence can then be used in conjunction with academic and professional judgment to decide how to implement interventions or change policies (Rundle-Thiele, Parkinson, & Arli, 2017). According to Cook, Mulrow, and Haynes (1997), systematic reviews are the most extensively used technique for assembling the findings of numerous research that examine the same topics across disciplines. Additionally, systematic reviews follow a clear and open method that always includes the following steps: defining the research topic or problem, classifying and evaluating the available evidence, combining the results, and coming to the most appropriate conclusions (Wamba, Akter, Edwards, Chopin, & Gnanzou, 2015).

As in any academic field, accurate knowledge syntheses are now essential to maintaining with the rapid expansion of any discipline literature. They support researchers in their search for, discovery of, and synthesis of the content's materials of multiple empirical and conceptual studies as well as practitioners, professors, and graduate students. According to Paré, Trudel, Jaana, and Kitsiou (2015), systematic literature reviews are crucial for a number of reasons, including (a) classifying what has been tested on a subject or topic; (b) assessing the degree to which a particular research area reported any interpretable tendencies or designs; (c) combining empirical results related to a specific research question to inform evidence-based practice; (d) introducing new frameworks and theories; and (e) identifying interpretable tendencies.

3.3 A systematic review: a research option for postgraduate studies

For a very long time, systematic literature review has been acknowledged as a legitimate research methodology (Greenhalgh, Thorne, & Malterud, 2018). As part of higher education study and assessment, a variety of Master's programs teach students in systematic review methodologies and improve their capacity to conduct systematic reviews (Greenhalgh, Thorne & Malterud (2018). According to Devolder, van Braak and Tondeur (2012), it is generally acknowledged that using a systematic review to do research gives students the opportunity to enhance their skills in categorizing, evaluating, and producing research findings. In a similar Boland, Cherry, and Dickson (2017) acknowledged that students conducting primary research would typically examine questions relating to current status or correlation factors; the main challenge with this type of research is that its generalizing result is frequently hampered by small sample sizes and time constraints. On the other hand, students who formulate questions to be answered by the systematic review method are more likely to have the chance to

deal with a variety of different study designs and populations without really needing to worry about the issues typically faced by researchers performing large-scale primary research (Boland et al., 2017). Due to the nature of a systematic review, students can engage in the field of recent research findings while developing their critical thinking and research synthesis skills (Kim, Sefcik, & Bradway, 2017). Additionally, a systematic review provides a wonderful learning opportunity and empowers students to identify and establish their own learning objectives (Voronina, Moroz, Sudarikov, Rakhimzhanova, & Muratbakeev, 2017). In order to provide insightful and fact-based responses, this thesis uses a systematic review approach to evaluate and develop the best available evidence relevant to blockchain adaption in internal audit. Finally, this thesis is an original, self-directed piece of academic writing that explores the effects of blockchain on internal audit using unique, in-depth arguments.

3.4 Systematic review protocol

The goal of the systematic review process was to be the most popular and well-known in all of the scientific disciplines (Tursunbayeva, Franco, & Pagliari, 2017). Any system should start with a protocol since it can serve as a guide for future reviews (Tursunbayeva, Franco & Pagliari, 2017). Additionally, the protocol specifies the goals, the employed techniques, and the key anticipated results of the systematic review. It also encourages transparency and method clarity, and it gives peers the opportunity to assess how the study extracts evidence to summarize outcome data (Badia et al., 2017). A few proposed protocols for performing a systematic review are the Cochrane Collaboration, the Campbell Collaboration, the Joanna Briggs Institute, and the BEME Collaborations. However, this thesis conforms to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta Analyses) guideline.

Wei, Zheng, Deng, Wang, Li, and Fu (2020) claim that PRISMA is an evidence-based minimum set of components that was developed to assist authors in presenting a range of systematic reviews and meta analyses. PRISMA was initially intended to be used as a framework for reporting reviews of various types of research, but it has now been expanded to focus on systematic reviews and meta analyses of randomized trials (Haddaway, Macura, Whaley, & Pullin, 2018). A systematic review and meta title, analysis's abstract, methods, results, discussion, and financing, if any, are among the 27 things on the checklist. The quality of the systematic review's reporting is more likely to be improved by the use of checklists like PRISMA, and the selection of the papers to include will be significantly more transparent as a result.

According to the PRISMA statement, the methodology section check list should include the following items: Describe and justify the study and report components, such as "years considered, language, and publishing status," that will be used as qualifying criteria. List all of the sources of information used, the date the search was last done, and the results (databases with dates of coverage, contacts with research authors to discover further studies), acknowledge the whole electronic search process for databases, limiting it if necessary to allow for repetition, outlines the "screening, eligibility," any techniques for obtaining and confirming data from investigators, including the method of data extraction from reports, to determine which research to include in a systematic review ("piloted forms, independently, in duplicate"). A description of the methods used to assess the risk of bias in particular research, "including the requirement of whether this was performed at the study or outcome level," and the use of this information in data synthesis are provided, along with a list and definition of all the variables for which data were sought. Define any bias risk

assessment that might affect the overall body of evidence. Examples include editorial bias in publications, selective study reporting, and additional analysis techniques. Describe the processes utilized to combine study results and process data.

3.5 Search strategy

The systematic review's search procedure is crucial since errors could lead to a biased or otherwise insufficient evidence base (Siddaway, Wood, & Hedges, 2019). To increase recall and effectively address a variety of potentially biased aspects, searches in systematic reviews must be well-built (McGowan & Sampson, 2005). In order to choose the papers for this review, we conduct searches and examine the search results. Finding studies that empirically looked at the factors impacting the influence of blockchain on internal audit was the aim of the literature search. An online search of bibliographic databases was conducted in October 2022 and included Scopus, Google Scholar, Springer, elsevier, Conferences and Web of Science. These databases were chosen after librarians who support this with sophisticated search strategies that make use of specific databases' distinctive syntax, database scope searches, and comparisons to similar systematic studies were consulted. Additionally, are also carried out because they are more likely to yield relevant results for this investigation (blockchain in internal auditing), and Internet searches are also used. In order to do keyword searches. Additionally, sources of additional pertinent data were searched in reference lists of research found to be pertinent for this review as well as related studies.

Checking previous systematic reviews for hints is an effective way to analyze the search tactics utilized in terms of phrases and combinations (Bramer, De Jonge, Rethlefsen, Mast & Kleijnen, 2018). According to Kitchenham (2004), it is crucial to

carefully record the search process in enough detail to guarantee that it can be accurately represented in the review. Additionally, a spreadsheet should be made to extract the specifics of the searches and save search histories. The date on which the search was conducted, the database's name, the keywords used and how they were combined in the search, the years searched, and the number of studies acknowledged are all crucial (Kitchenham, 2004). The following keywords and phrases were combined to do the search: ("Blockchain Technology", “Digital Transition”, “Blockchain’s, “Smart Contracts”, "Internal Audit", “Internal Audit Standards”, “Internal Audit”, “Internal control”, “Systematic Review”). The researcher spent the effort to research all feasible synonyms and related terms for each of our elements or concepts, ensuring that our search returns the most relevant results. The researcher scan relevant major documents, and other publications for alternate wording to the search terms used in previous publications or systematic reviews.

3.6 Study selection

The systematic review must have inclusion and exclusion criteria since they define the review's parameters. It is critical to have eligibility requirements that are clear, explicit, and comprehensive (Brereton, Kitchenham, Budgen, Turner, & Khalil, 2007). Scoping searches are crucial for determining proper criteria because there are so many distinct factors to consider (Brereton et al., 2007). The inclusion/exclusion criteria are frequently provided in the systematic review's methodology section as a paragraph or table. The criteria for evaluating the sorts of persons included in research in a review should be sufficiently broad to account for the anticipated diversity of studies, yet satisfactorily narrow to ensure that, when studies are taken together, an expressive conclusion can be drawn (Chen & Babar, 2011). The demographic of interest for your

research question and objectives, a specific geographic area, certain settings (schools, urban or rural locations), and other pertinent contextual aspects of your research question and objectives should all be taken into account when choosing participants (Chen & Babar, 2011).

In order to discover research offering original and actual data relating to the topic of blockchain in internal auditing, this study undertook a thorough review of every potentially pertinent article. As was already noted, for studies to be considered in this study, they have to self-identify as blockchain in internal auditing. The inclusion criteria also put a lot of effort into finding empirical studies that look at what influences blockchain adoption and blockchain use in internal auditing. Additionally, studies conducted between 2017 and 2023 in a peer-reviewed journal must be in the English language.

Additionally, studies covering societal phenomena other than the adoption of blockchain technology and its impact on internal audit were disregarded. Reviews, conceptual articles, method-focused papers, and papers examining internal audit and blockchain from a sociological or psychological perspective were also rejected. Publications that only examined the learning management systems implementation stages, training, and technical reports, as well as publications that evaluated general impressions of information and communication technology usage, were also excluded from consideration for this study.

3.7 Procedures

The aforementioned keywords and phrases were used in each database's internet search. The systematic review used Endnotes software, which is highly recommended, to import the search results with abstracts. There are two stages of screening and selecting results to be included in the systematic review, according to (Bramer, Milic, & Mast, 2017). The first stage is initial screening, when many results can be discarded. Duplication must be eliminated, and the title and abstract of each article must be checked for relevance to the subject. The second screening stage entails a closer examination of the items that pass the first screening stage. At this step, include or omit publications according to the inclusion or exclusion criteria specified in the protocol, and justify any exclusion of particular studies. The screening of the data for this investigation started with the eradication of duplicate articles. Titles were checked to exclude unrelated publications, and the remaining papers were then examined for further investigation into their applicability to the problem.

In the beginning, 6 databases were searched, yielding a total of 1151 articles, while 61 Review articles were eliminated, due to duplication a total of 227 studies were left out. Additionally, 366 studies that were either unrelated or non-empirical were excluded, 49 conceptual publications were left out, and studies conducted in developed nations (n=172) were excluded from the initial screening. In addition, 5 studies that were written in languages other than English or that used no models at all were eliminated, along with 183 studies that utilized models other than tam or extended tam were excluded. 88 research were carefully reviewed, and 69 additional papers were eliminated with justification. The total number of sources used for this inquiry was 19.

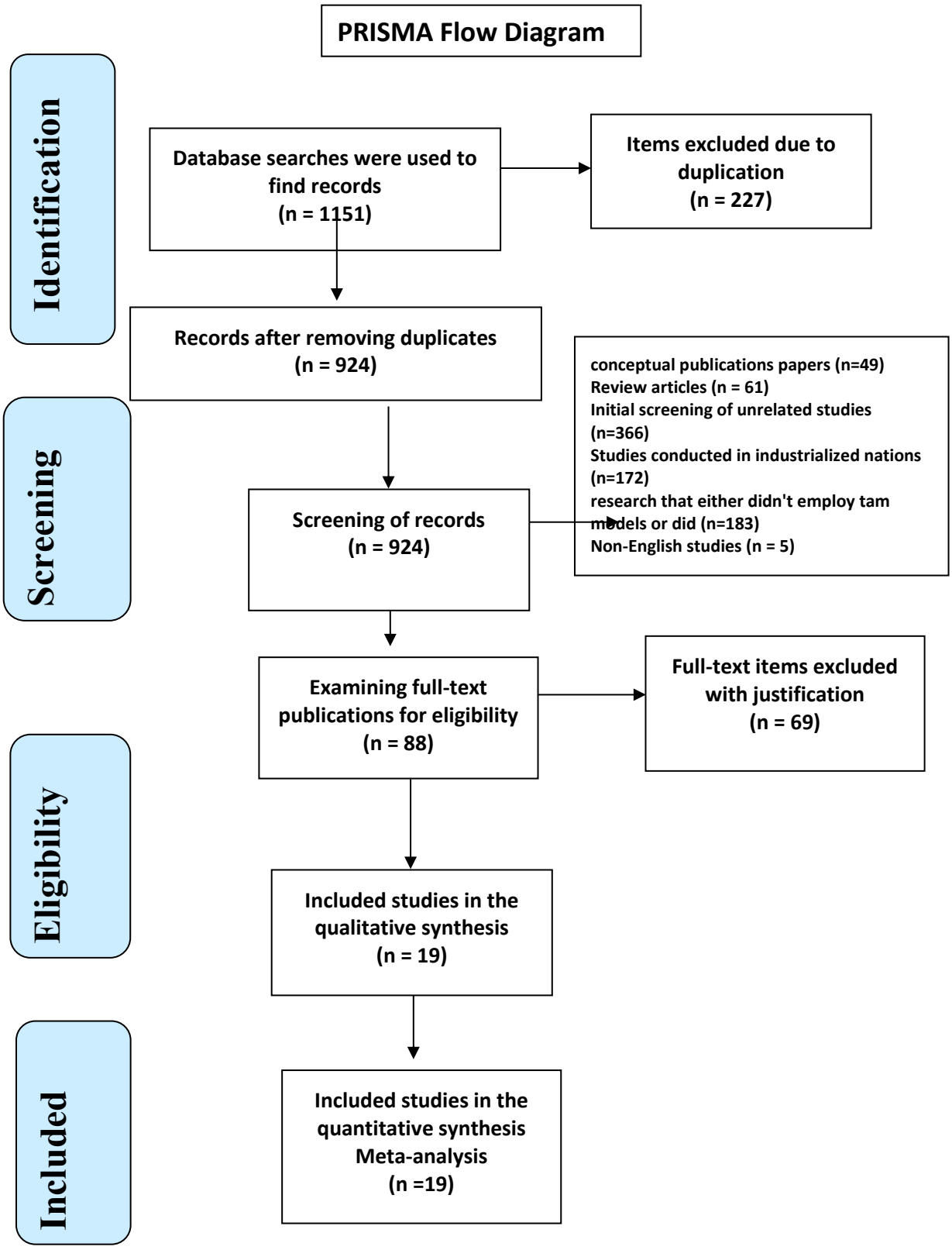

Figure 3-1 PRISMA Flow Diagram

Chapter Four:

Presentation and discussion of results

Chapter Four
Presentation and discussion of results

4.1 Introduction

The primary objective of this study, which will use a systematic literature review technique, is to investigate the impact of blockchain on internal auditing.

The researcher will achieve the study objectives throughout this chapter by responding to the study questions, evaluating, synthesizing, and summarizing the included articles addressing each relationship between the study variables or their equivalents.

4.2 characteristics of the collected articles

The primary study question, "What is the nature of the impact of Blockchain on Internal Auditing?" will be addressed by the researcher in order to achieve the main study objective, which is to collect, sort, classify, include, exclude, analyze, and summarize studies that explore the impact of Blockchain on Internal Auditing?

The researcher will review works that looked at how Blockchain affected internal auditing (performance standards and characteristics standards).

Table 4.1 lists the publications that were picked to address how blockchain affects internal auditing. It also provides information about each article's individual qualities (Article Title, Search engine, Authors, Date of publication, Language, Article type and the Journals)

Table 4.1: characteristics of the collected articles (study population)

No	Citation	Article Title	Search engine	Authors	Date of publication	Language	Article type	Journal
1	(Pizzi, Venturelli, Variale & Macario, 2021)	A bibliometric analysis for evaluating the effects of the digital transition on internal auditing	Elsevier	Simone Pizzi , Andrea Venturelli , Michele Variale, Giuseppe Pio Macario	2021	English	Mixed method	Technology in Society
2	(Vardia, 2022)	Adoption of Blockchain Technology in Accounting and Auditing	Web of Science	Shilpa Vardia	2022	English	Quantitative study	Pacific Business Review (International)
3	(Jumah & Li, 2020)	Auditors' Adoption of Blockchain Technology	Conferences	Ahmad Juma'h Yuan Li	2020	English	Quantitative study	Accounting Information Systems (SIGASYS)
4	(Zhang,& Shah, 2023)	The Effect of Blockchain Technology on Financial Sector Internal Auditing	Springer	Chi Zhang Sabarina Mohammed Shah	2023	English	Quantitative study	Springer, Cham
5	(Popchev, Radeva & Velichkova, 2021)	Blockchain's effects on internal audit	Scopus	Popchev Radeva Velichkova	2021	English	Quantitative study	IEEE

No	Citation	Article Title	Search engine	Authors	Date of publication	Language	Article type	Journal
6	(Liu, Wu & Xu, 2019)	What Are the Potential Effects of Blockchain Technology on Auditing and Accounting? Permissioned vs. Permissionless Blockchain	Google scholar	Manlu Liu Kean Wu Jennifer Jie Xu	2019	English	Quantitative study	CURRENT ISSUES IN AUDITING
7	(Hayrettin & KARABURUN, 2020)	In light of blockchain technology, changes to the professional profile of auditors	Google scholar	Hayrettin USUL Gözde Karaburun	2020	English	Quantitative study	European Journal of Digital Economy Research
8	(Kabir, Sobhani, Mohamed & Ashrafi, 2022)	The moderating function of blockchain in the impact of integrity and internal audit transparency on audit quality	Google scholar	Kabir, Sobhani Mohamed Ashrafi	2022	English	Quantitative study	Management & Accounting Review
9	(Rooney, Aiken & Rooney, 2017)	Is internal audit ready for blockchain?	Scopus	Rooney, Aiken & Rooney	2017	English	Quantitative study	Technology Innovation Management Review
10	(De Andrés & Lorca, 2021)	Regarding how smart contracts affect auditing	Scopus	Javier De Andrés Pedro Lorca	2021	English	Quantitative study	International Journal of Digital Accounting Research

No	Citation	Article Title	Search engine	Authors	Date of publication	Language	Article type	Journal
11	(Patterson, 2022)	Blockchain and Big Data's Impact on the Audit Profession	Google scholar	Tereesha Marquette Patterson	2022	English	qualitative study	Liberty University, School of Business
12	(Gokoglan, Cetin & Bilen, 2022)	Blockchain technology and its impact on audit activities	Springer	Kadir Gokoglan Sakine Cetin Abdulkadir Bilen	2022	English	Quantitative study	ournal of Economics Finance and Accounting
13	(Cangemi & Brennan, 2019)	The demand for automated audits is increasing as a result of blockchain auditing!	Scopus	Cangemi & Brennan	2019	English	Quantitative study	EDPACS
14	(Gauthier & Brender, 2021)	What role does the emerging use of blockchain play in the present auditing standards?	Scopus	Gauthier & Brender	2021	English	Quantitative study	Managerial auditing journal
15	(Bonyuet, 2020)	Summary and effects of blockchain technology on auditing	Scopus	Bonyuet	2020	English	Quantitative study	The International Journal of Digital Accounting Research

No	Citation	Article Title	Search engine	Authors	Date of publication	Language	Article type	Journal
16	(Kaaniche & Laurent, 2017)	Privacy and Availability in a Blockchain-based Data Usage Auditing Architecture	Scopus	Kaaniche & Laurent	2017	English	Quantitative study	IEEE
17	(Desplebin, Lux & Petit, 2021)	Blockchain and the future of accounting and auditing: To Be or Not to Be?	Scopus	Desplebin, Lux & Petit	2021	English	Quantitative study	Accounting Perspectives
18	(Tušek, Ježovita & Halar, 2021)	Expertise of Critical Auditors for Blockchain Business Environment	Scopus	Tušek, Ježovita & Halar	2021	English	Quantitative study	Zagreb International Review of Economics & Business
19	(Radeva, 2022)	Blockchains: Useful Methods	Scopus	Radeva	2022	English	Quantitative study	Engineering Sciences

Following the search phase, the researcher collected a total of 19 articles from the selected search engines that were pertinent to the subject matter of the study. These articles were then categorized according to the search engines, date of publication, and journal type.:

- In order to find relevant material for the study issue, numerous search engines were screened during this search procedure. Google Scholar, Scopus, Elsevier, Conferences, springer and Web of Science are the six search engines that have been picked because they are commonly used to look up academic articles in the management and business sectors. Following what was shown in table 1, Scopus has the most articles (53%) followed by Google Scholar (21%), Springer (11%), and then elsevier, Conferences, and Web of Science, all of which have 0.05%. Google Scholar compiles content from many search engines, which explains why there is a higher percentage compared to other engines.

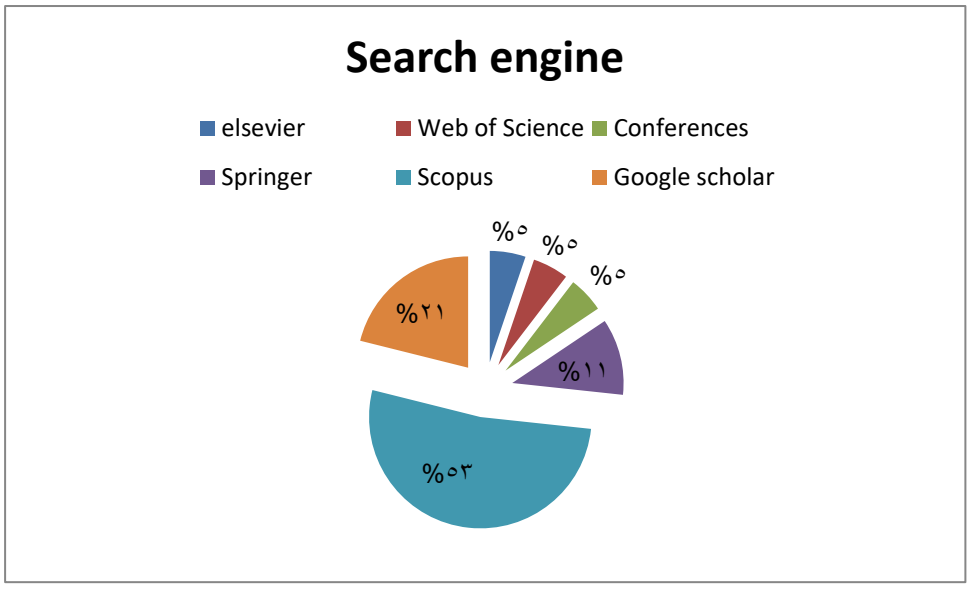

Figure 4-1: Percentage of articles per search engines

According to the time distribution of the articles, year is 2023, with 0.053 percent of all articles, followed by 2022, 0.26 percent, 2021, 0.31 percent, 2020, 0.159 percent, 2019 (0.105 percent), and 2017 (0.105 percent).

The researcher discovered that the most recent years (2021 and 2022) had the highest levels of publications due to the expanding environmental complexity, ambiguity, importance, and demand of the study issue. Due to the fact that the process of looking for articles began in 2017, the number of research for the year 2016 is not entirely accurate.

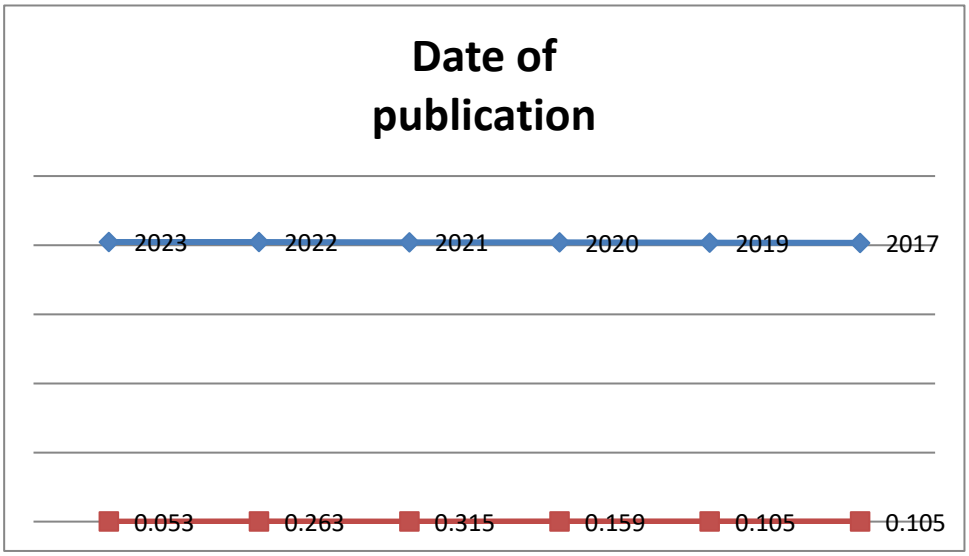

Figure 4-2: Percentage of articles per year

This shows that the research variables were used across a wide range of business topics, industries, and geographic regions, and it will be useful in generalizing the findings when the articles in the study sample have been examined and synthesized. The researcher came across a wide range of periodicals and topics.

4.3 blockchain and internal audit

By answering the primary research question, what kind of impact does blockchain have on internal auditing? By gathering, classifying, categorizing, including, omitting, analyzing, and summarizing papers that investigate the influence of Blockchain on Internal Audit, the researcher will succeed in achieving the primary study objective.

The researcher will review works that looked at how Blockchain affected internal audit (performance standards and characteristics standards).

The publications selected that discuss how blockchain impacts internal audit are shown in Table 4.2 Data about each article's methodology, sample, context of application, research method, and conclusions in relation to the study's goals and open-ended questions were acquired by the researcher.

Table 4-2: Articles about the impact of Blockchain on Internal Audit

No	Citation	Findings	Methodology	Sample	Study tool
1	(Pizzi, Venturelli, Variale & Macario, 2021)	The continued emphasis on digitizing the process confirms the intimate relationship between theory and practices in auditing because of the major importance policy makers and practitioners have placed on the dematerialization of accounting processes.	bibliometric analysis and literature review are both used in a hybrid strategy.	142 respondents'	questionnaire
2	(Vardia, 2022)	According to the findings of our study, just one benefit—better transparency between internal and external users of accounting— is shared by all respondents, while there are considerable differences in respondents' opinions regarding the other benefits. And while all respondents shared the same impression that Blockchain technology consumes a lot of energy, there was a considerable variance in opinion regarding the other challenges.	Quantitative study	75 respondents'	questionnaire
3	(Jumah & Li, 2020)	shows the adoption of Blockchain is negatively impacted by both materiality and PS. Internal and external auditors are surveyed to gather empirical data for our study model's validation. The study identifies some significant elements that affect auditors' acceptance of Blockchain and offers recommendations for future study and practice.	Quantitative study	112 auditors'	questionnaire
4	(Zhang, & Shah, 2023)	The study found that a continuous audit model utilizing blockchain smart contracts was produced by the internal audit function and its connections to blockchain basics. The study, which takes into account both the significant advantages and potential problems of using blockchain technology in the current accounting system, addresses a knowledge gap on the effects of blockchain on internal auditing.	Quantitative study	142 respondents'	questionnaire

No	Citation	Findings	Methodology	Sample	Study tool
5	(Popchev, Radeva & Velichkova, 2021)	The need for a deeper comprehension of the technology itself, the potential impact of risk on the entire organization, changes to workflow and control procedures, increased executive and management staff expertise, updates to risk management procedures, and new laws and regulations should all serve as guidelines for internal auditors.	Quantitative study	196 respondents'	questionnaire
6	(Liu, Wu & Xu, 2019)	Continuous internal auditing is possible with blockchain applications thanks to real-time access to transaction records.	Quantitative study	115 respondents'	questionnaire
7	(Hayrettin & KARABURUN, 2020)	Blockchain is regarded as a key component in a significant digital revolution. The internal auditing process and internal auditors are both impacted by this wave of the digital revolution.	Quantitative study	211 respondents'	questionnaire
8	(Kabir, Sobhani, Mohamed & Ashrafi, 2022)	Managing the relationship between internal audit quality and integrity may be done using blockchain technology. Similar relationships exist between internal audit quality and transparency, which future blockchain use modifies. As a result, this study created a unique model with integrity, internal audit transparency, and potential blockchain application as the determinants. This model provided a novel explanation for the factors that can improve audit quality.	Quantitative study	97 respondents'	questionnaire
9	(Rooney, Aiken & Rooney, 2017)	I found that internal auditors' familiarity with the business and organization they assist is one of their most significant strategic advantages. Without this information, it will be difficult to provide an accurate evaluation of the governance, risk, and control environment, which will be essential for facilitating the adoption of blockchain.	Quantitative study	109 respondents'	questionnaire
10	(De Andrés & Lorca, 2021)	Smart contracts are impact on internal auditing	Quantitative study	88 respondents'	questionnaire

No	Citation	Findings	Methodology	Sample	Study tool
11	(Patterson, 2022)	Regarding the audit's usage of big data and blockchain, four themes were discovered that were in line with participant feedback. Themes that emerged included the need for additional training to be fully prepared for technological spectra, a need for software developments outside of the typical excel applications, maintaining constant communication with information (IT) technology personnel, and an admission of the limited practical application of blockchain on the audit.	qualitative study	11 accountants	Interviews
12	(Gokoglan, Cetin & Bilen, 2022)	The decentralized verification method that blockchain technology possesses is its most notable feature. It is demonstrated in this regard as one of the areas where digital transformation is experienced that is most successfully. The following list summarizes the applications of blockchain technology: finance, government, health, supply chain, education, and auditing. Due to the dependability, transparency, and timeliness of the data used in auditing, blockchain technology has the greatest influence on the audit profession in terms of lowering the cost of monitoring and control. Blockchain uses several sister databases rather than a single, central database to produce a more reliable audit trail.	qualitative study	17 auditors	Interviews
13	(Cangemi & Brennan, 2019)	With Blockchain, there are new risks that need to be considered as well as new claims and controls, particularly with the inclusion of smart contracts.	Quantitative study	186 internal auditors	questionnaire
14	(Gauthier & Brender, 2021)	The findings point to a rising demand for internal auditing standards as well as a scheduling discrepancy between the authorities' slowness to introduce new standards or update existing ones and the rapidly evolving IT environment.	Quantitative study	90 internal auditors	interviews
15	(Bonyuet, 2020)	There is impact of Blockchain on internal auditing	Quantitative study	45 respondents'	Interviews

No	Citation	Findings	Methodology	Sample	Study tool
16	(Kaaniche & Laurent, 2017)	there is a Blockchain based Auditing	Quantitative study	28 respondents' (to management)	questionnaire
17	(Desplebin, Lux & Petit, 2021)	influence of blockchain technology on organizations and accounting systems.	Quantitative study	101 internal auditors	questionnaire
18	(Tušek, Ježovita & Halar, 2021)	According to the empirical study's findings, both internal and external auditors in Croatia believe that advanced analytical procedures (APs) competence is a must for auditing blockchain based business activities.	Quantitative study	sample of 148 external and internal auditors in Croatia	questionnaire
19	(Radeva, 2022)	They present an algorithm for choosing blockchain platforms and a text mining technique for plant genetic resources.	Quantitative study	69 internal auditors	questionnaire

4.4 Methodology

The study of papers on Blockchain and Internal Audit was conducted using a variety of approaches; the two that were most frequently used were quantitative design and case study design, each with 89.4% of the total, and mixed method design and qualitative study, each with 0.053%.

This will make it easier to understand the approaches being employed, which ones are most frequently used, and where the research are going. As a result, it aids in the researcher's completion of the systematic literature review and the formulation of sound suggestions for additional research.

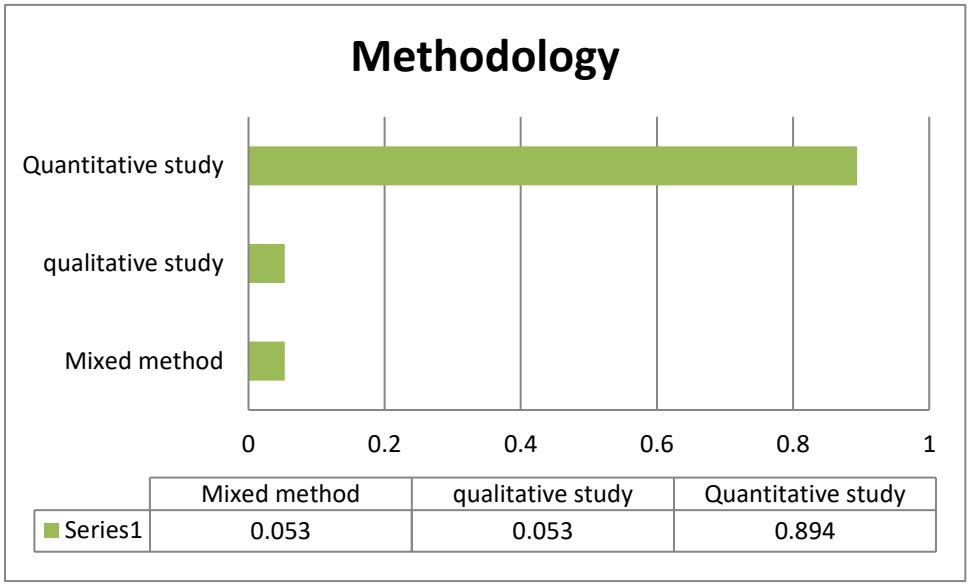

Figure 4-3: Methodology used in Blockchain and Internal Audit articles

4.5 Instrument

In both the Blockchain and Internal Audit, there were two tools utilized to gather data. 80% of the articles utilized the questionnaire tool, and 20% of the articles used the interview tool. Additionally, the majority of papers (94.7%) only used one data collection method, whereas 5.3% used two, which improves the authenticity and quality of the data gathered.

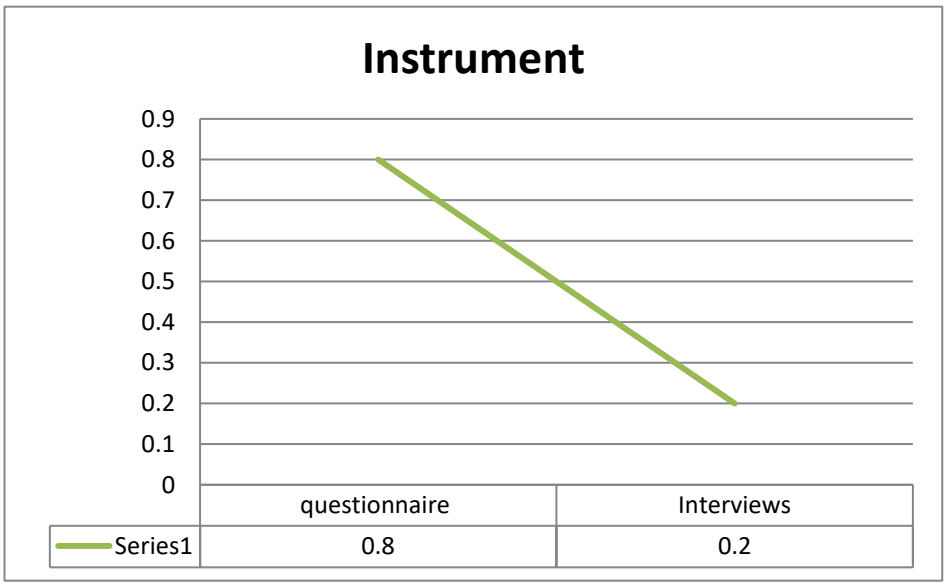

Figure 4-4: Blockchain and Internal Audit data collection instruments

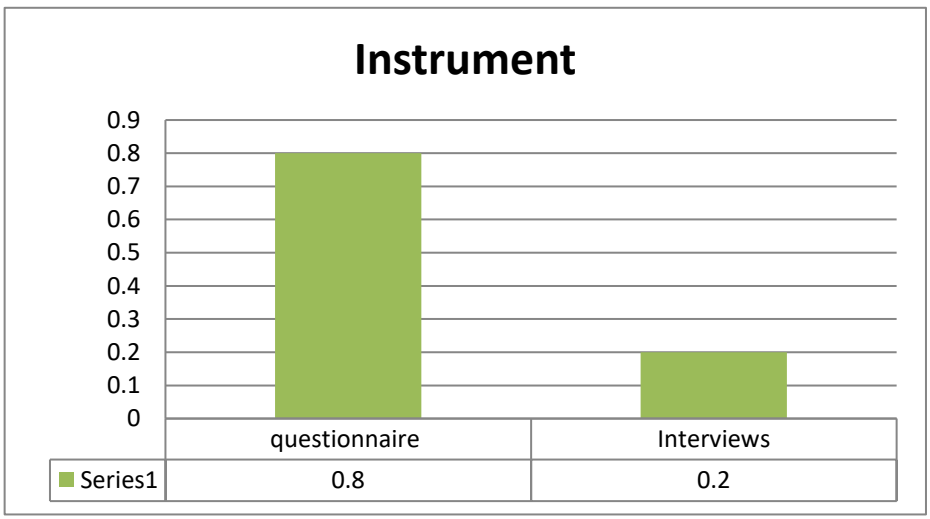

Figure 4-5: Number of tools used in Blockchain and Internal Audit articles

4.6 Findings

The majority of 10 articles out of (52.6%) confirmed that there is a relationship between blockchain and internal audit and that this relationship is supported. However, 31.6% of articles did not support this relationship, and 15.8% of articles did not look at the direct connection between blockchain and internal audit as in Table 4-2.

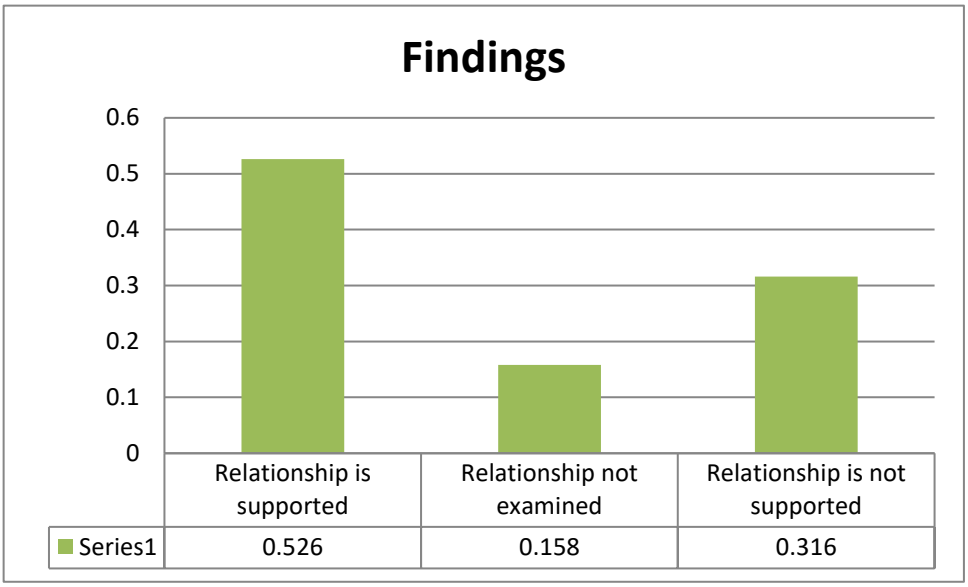

Figure 4-6: Findings of Blockchain and Internal Audit articles

Figure 4-7: The impact of Blockchain on Internal Audit

4.7 Standards of internal audit

What aspects of internal audit have been the subject of the most investigation, in response to the third research question? The third study goal, to identify the components of internal audit or its equivalents that are commonly evaluated, will be accomplished by the researcher.

The works will be subjected to an internal audit by the researcher. The following performance standards and characteristics standards apply to managing internal audit activity: work nature, risk acceptance notification, planning internal audit assignment, report outcomes, and workflow monitoring (Purpose, authority and responsibility, Independence and objectivity, Necessary professional skill and care and Quality assurance and improvement programs).

Table 4-3: Standards of Internal Audit

Citation	PS (Managing the internal audit activity)	PS (work nature)	PS(Notification of risk acceptance)	PS (Planning the internal audit assignment)	PS (Report the results)	PS (Monitor workflow)	ChS (Purpose, authority and responsibility)
(Pizzi, Venturelli, Variale & Macario, 2021)							
(Vardia, 2022)							Yes
(Jumah & Li, 2020)							Yes
(Zhang,& Shah, 2023)							
(Popchev, Radeva & Velichkova, 2021)							Yes
(Liu, Wu & Xu, 2019)							
(Hayrettin & KARABURUN, 2020)							
(Kabir, Sobhani, Mohamed & Ashrafi, 2022)							
(Rooney, Aiken & Rooney, 2017)							yes
(De Andrés & Lorca, 2021)							
(Patterson, 2022)							yes
(Gokoglan, Cetin & Bilen, 2022)							yes
(Cangemi & Brennan, 2019)							
(Gauthier & Brender, 2021)							
(Bonyuet, 2020)							
(Kaaniche & Laurent, 2017)							
(Desplebin, Lux & Petit, 2021)							yes
(Tušek, Ježovita & Halar, 2021)							yes
(Radeva, 2022)							

- *PS = Performance Standards
- *ChS = Characteristics Standards

Citation	ChS (Independence and objectivity)	ChS (Necessary professional skill and care)	ChS (Quality assurance and improvement programs)
(Pizzi, Venturelli, Variale & Macario, 2021)			
(Vardia, 2022)	Yes		Yes
(Jumah & Li, 2020)		Yes	
(Zhang,& Shah, 2023)	Yes		
(Popchev, Radeva & Velichkova, 2021)	Yes	Yes	Yes
(Liu, Wu & Xu, 2019)	Yes		Yes
(Hayrettin & KARABURUN, 2020)		Yes	
(Kabir, Sobhani, Mohamed & Ashrafi, 2022)	Yes	Yes	Yes
(Rooney, Aiken & Rooney, 2017)	Yes	Yes	
(De Andrés & Lorca, 2021)	Yes		Yes
(Patterson, 2022)	Yes	Yes	Yes
(Gokoglan, Cetin & Bilen, 2022)	Yes	Yes	Yes
(Cangemi & Brennan, 2019)			Yes
(Gauthier & Brender, 2021)		Yes	Yes
(Bonyuet, 2020)			
(Kaaniche & Laurent, 2017)		Yes	Yes
(Desplebin, Lux & Petit, 2021)	Yes	Yes	Yes
(Tušek, Ježovita & Halar, 2021)	Yes		Yes
(Radeva, 2022)	Yes	Yes	Yes

- *PS = Performance Standards
- *ChS = Characteristics Standards

Table 4-4: Internal Audit' repetition

Dimensions	Repetition	Percent from total articles
Performance Standards		
Managing the internal audit activity	0	0%
work nature	0	0%
Notification of risk acceptance	0	0%
Planning the internal audit assignment	0	0%
Report the results	0	0%
Monitor workflow	0	0%
Characteristics standards		
Purpose, authority and responsibility	8	17.8 %
Independence and objectivity	12	26.6 %
Necessary professional skill and care	12	26.6 %
Quality assurance and improvement program	13	29 %
Total	**45**	**100 %**

Scholars used a variety of internal audit standards in their relationships with blockchain and internal auditing, as shown in tables 4.3 and 4.4. The most frequently used standards were quality assurance and improvement programs (29%), followed by independence and objectivity and the need for necessary professional skill and care, both of which came in at (26.60%), and then purpose, authority, and responsibility, which came in at (17.8%). Scholars do not place much emphasis on the performance standard.

Figure 4-8: Internal Audit dimensions' repetition

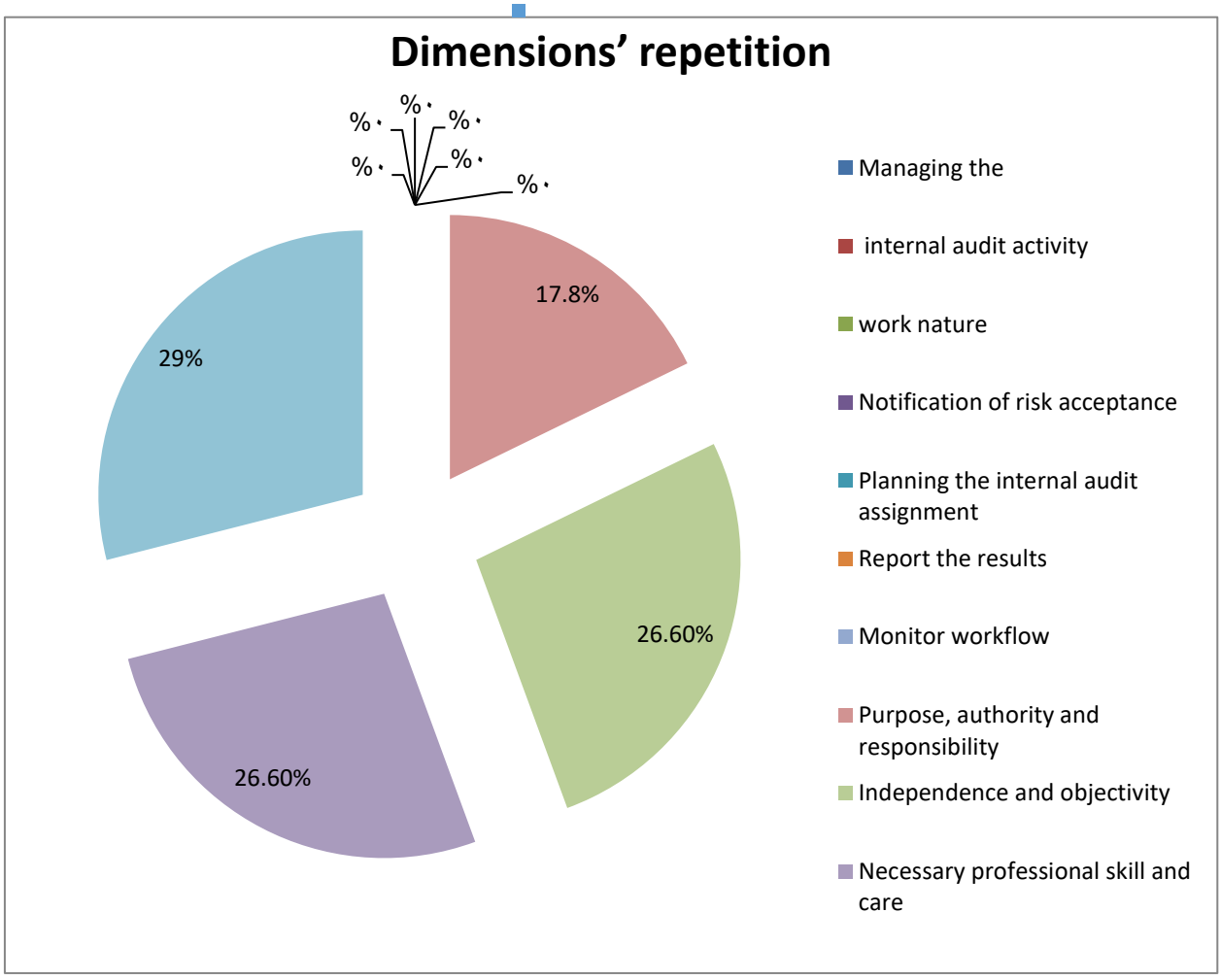

Figure 4-9: The most frequent studied dimensions of internal audit

Chapter Five:

Findings discussion and recommendations:

5-1 Introduction

5-2 Result discussion

5-3 Recommendations

5-4 Future studies

Chapter Five:
Findings discussion and recommendations:

5.1 Introduction

The presentation of the conclusions will come after the discussion of the findings, in accordance with the objectives of the study, and the chapter will end with ideas and recommendations.

5.2 Result discussion

In the literature that was presented and analyzed, the researcher found that 10 publications out of 19 publications (52.6%) validated that there is an impact of blockchain on internal audit, indicating that the link is supported. This rationale illustrates how internal auditing is impacted by blockchain in all of its relationships. Because of its more dynamic and adaptable character, blockchain enables businesses to examine data, make decisions, and create plans that take into account the constantly changing environment in which they operate. Blockchain is a prerequisite for businesses to enhance internal audit by creating internal audit plans and seizing chances that help businesses get over uncertainty and complexity in their operating environments. In this regard, businesses will ensure sustainability and growth if they invest in the interaction between blockchain technology and internal audit or any of its components.

The environment is changing rapidly due to change, complexity, and unpredictability, including the pandemic, shifting market demands, and the rapid advancement of technology. Organizations must therefore adopt a proactive rather than a reactive approach to deal with these difficulties, using Blockchain as a dynamic capacity that

gives them flexibility.

Moreover, the researcher discovered that 6 articles out of 19 (31.6%) corroborated that there is not impact of blockchain on internal audit, indicating that the claim that there is no impact is unfounded. This justification supports the conclusion that there is no impact of blockchain on internal audit.

Examples of performance criteria that apply to managing internal audit activities include task type, risk acceptance notification, planning internal audit assignment, report outcomes, and process monitoring (Purpose, authority and responsibility, Independence and objectivity, Necessary professional skill and care and Quality assurance and improvement program).

The utilization of internal audit performance standards and characteristic standards (Work Nature, Managing Internal Audit Activity, Risk Acceptance Notification, Planning Internal Audit Assignment, Report Results, and Workflow Monitoring) was observed (Purpose, authority and responsibility, Independence and objectivity, Necessary professional skill and care and Quality assurance and improvement program) There were 4 distinct Standards discovered; this discrepancy may have arisen from the divergent viewpoints of the researchers and the vast range of businesses included in the articles.

In accordance with the internal audit mission and the mandatory components of the international professional framework for the practice of internal auditing, the standard of purpose, authority, and responsibility confirms that the purpose, authority, and responsibility of the internal auditing activity must be formally defined within the internal audit charter. Regarding impartiality and independence, the auditing process

must be Both the internal auditors' independence and the objectivity of their job are required. The tasks associated with conducting internal audits must be carried out with the requisite professional skill and attention. They claimed that the requirement for the chief audit executive to design and manage a quality assurance and improvement program is confirmed by the quality assurance and improvement program standard. It covers every facet of the internal auditing process.

Performance Standards (Managing Internal Audit Activity, Work Nature, Risk Acceptance Notification, Planning Internal Audit Assignment, Report Results, and Workflow Monitoring) were not covered in any prior studies, which shows that there is a gap in the prior research on the impact of blockchain technology on internal audit.

5.3 Recommendations

The study offers the following recommendations after providing the data analysis, discussing the findings, and outlining the key explorations:

- All businesses should invest in the impact of blockchain on internal auditing across all industries.:

1) Auditors should be guided by the need to learn more about the technology itself, the effects of risk on the entire organization, changes to workflow and control procedures, the addition of executive and management staff with additional expertise, updates to risk management policies, the addition of a new regulatory environment that is rapidly changing, and new regulations.
2) Attracting Blockchain-savvy auditors during the hiring and selection processes.
3) Establishing a setting that encourages auditors to conduct audits and make conclusions using blockchain.

4) Promoting the usage of blockchain throughout the firm by employing training programs and real-world examples.
5) Provide novel strategies and solutions to adjust to the current technology environment.
6) Fostering a collaborative management style that encourages learning and builds the capacity to use blockchain throughout the firm to ensure flexibility against change.
7) Using multidisciplinary education.
8) The quality of internal audit options is increased by ongoing environmental scanning and information gathering.
9) Analyzing the environment continuously and taking into account how change and uncertainty affect every area of internal audit.
10) Fostering a growth mindset to generate ongoing performance improvements for internal auditors.

5.4 Future studies

This study looked at how blockchain affected internal audit using a comprehensive literature review technique. In order to promote a successful and fruitful scientific research process, the following recommendations are offered for future study:

1. Internal audit the blockchain experimentally, focusing on Performance Standards (Managing Internal Audit Activity, Work Nature, Risk Acceptance Notification, Planning Internal Audit Assignment, Report Results, and Workflow Monitoring).
2. As the researcher discovered a gap in the literature when gathering papers, future studies should concentrate on the connection between blockchain and

internal audit.

3. Meta-analysis methodology, which enables statistical analysis of the findings of this study, can be used in future research.
4. Extending research by include understudied aspects of internal audit, blockchain.
5. Conducting research on balanced scoring, which focuses on both internal audit and external audit.
6. It is advised that future study, adopt the systematic literature review process across a variety of research issues.

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