TOWARDS AN UNDERSTANDING OF THE ADOPTION OF BLOCKCHAIN TECHNOLOGY IN ACCOUNTING

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Abstract

Blockchain technology has been hyped and considered as a potential game-changer for accounting and related industries. However, the majority of blockchain accounting research is conceptual or descriptive, with a particular lack of empirical evidence. Extant studies largely focus on the implications of blockchain in accounting practices and the accountancy profession as a whole without empirically addressing issues related to its adoption in organisations. This research aims to investigate blockchain adoption in the context of accounting by exploring factors influencing the organisation's decision to adopt blockchain technology.

This study uses the technology-organisation-environment (TOE) framework of technology adoption theories to comprehensively examine factors that could drive or inhibit the adoption of blockchain in accounting. Qualitative evidence, using the semi-structured interview approach, is collected from a group of experts with diverse backgrounds, including accountants, experts from Big Four accounting firms, IT professionals, blockchain experts, and key decision-makers of organisations to obtain insights into the research problem.

The findings of this study provide critical insights into organisational level adoption of blockchain technology in accounting from the perspective of experts and potential users. The research confirms the individual influence of technological, organisational, and environmental factors, and beyond individual influence, demonstrates the interrelated interactions and influences of these factors on the adoption decision. Among the factors identified, perceived benefits and insufficient knowledge are emphasised and considered as critical determinants of blockchain adoption in accounting. The trialability of the technology through available

blockchain-led accounting solutions is also highlighted for blockchain deployment across organisations' accounting practices. While technology-oriented factors, including risks, costs, and complexity, are identified as critical challenges, organisational and environmental aspects, such as innovativeness, top management support, external pressure, and COVID-19-induced transformation, are seen as drivers of blockchain adoption in the accounting environment.

This research contributes to the accounting and information system literature as one of the first empirical studies in this area, providing empirical evidence of the factors influencing organisational level adoption of blockchain technology in accounting. Further, the findings add new aspects to the blockchain adoption literature by adequately contextualising an established theoretical framework to the context of accounting. The research has significant managerial implications. It provides useful analysis tools for managers and business owners where they can use these key ten factors as a checklist to determine the value of blockchain adoption in accounting. The findings can further assist organisations in better understanding the implementation challenges of a blockchain accounting project and formulate strategies accordingly. Finally, the findings are useful for practitioners and the broader accounting information systems research community alike to understand blockchain accounting in their jurisdiction.

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List of Abbreviations

AICPA	American Institute of Certified Public Accountants
ASX	Australian Securities Exchange
BDA	Big Data Analytics
BT	Blockchain Technology
CHESS	Clearing House Electronic Sub-Register System
CPA	Certified Public Accountant
DOI	Diffusion of Innovation
EDI	Electronic Data Exchange
ERP	Enterprise Resource Planning
EY	Ernest & Young
PwC	PricewaterhouseCoopers
TAM	Technology Acceptance Model
TOE	Technology-Organisation-Environment Framework
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
UTAUT	Unified Theory of Acceptance and Use of Technology
XBRL	Extensible Business Reporting Language

Statement of Original Authorship

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Signature: QUT Verified Signature

Date: 03 February 2022

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Chapter 1: Introduction

1.1 Background

Blockchain technology (hereafter BT), a distributed ledger technology, has potential application in a variety of industries and a diverse range of activities, including supply chain management, banking, insurance, voting, healthcare, and government services (Beck et al., 2017; Hughes et al., 2019; Swan, 2015). Blockchain is a distributed database of records or transactions shared among participating parties without any central authority (Crosby et al., 2016; Kokina et al., 2017; Swan, 2015). Organisations across a range of industries are exploring ways to exploit the potential of this technology to streamline business processes, which would result in immutable, traceable, transparent, and trustworthy business solutions (Casino et al., 2019). The rise of this technology and its unique design also open up the possibility to shapeshift typical accounting and auditing procedures. Blockchain provides a novel form of reliable and efficient recording with nearly real-time communication and verification of accounting information, with the potential to create a new accounting eco-system (Bonson & Bednarova, 2019; Dai & Vasarhelyi, 2017; Demirkan et al., 2020). The convergence of accounting and blockchain shows great promise to enhance trust and transparency of information, promote standardisation and accountability, ensure real-time reporting and continuous auditing, and reduce human error and fraud in financial reporting (Bonson & Bednarova, 2019; Cai, 2021; Jackson et al., 2020; Kokina et al., 2017; Moll & Yigitbasioglu, 2019; Wang & Kogan, 2018). Blockchain has potential and disruptive impacts on accounting, including financial accounting (i.e. distributed ledger allows for transactional reporting and increase financial visibility at different levels), auditing (i.e. using immutable and traceable records, auditors could verify

entire population of transactions rather than on sample at the end of financial year), and management accounting (i.e. real-time access to performance data could ensure immediate corrective actions and improved managerial decision) (Moll & Yigitbasioglu, 2019). However, despite its acknowledged importance and implications, blockchain is still under-utilised in the accounting domain (Deloitte, 2018b; Tiron-Tudor et al., 2021).

Organisations have made strides in the blockchain space in a variety of different business operations. For instance, the Australian Securities Exchange (ASX) have announced their intent to replace the current Clearing House Electronic Sub-register System (CHESS) with a blockchain-based post-trade system in April 2023 (ASX, 2019, 2020). Microsoft recently announced a partnership with Ernest & Young (EY) to use the Ethereum blockchain for Xbox gaming royalties (EY, 2020a) and organisations such as IBM, JPMorgan, and Fujitsu are already leading the way to blockchain-enabled solutions (Wolfson, 2020). A global blockchain survey by Deloitte (2020b) revealed that business owners attitudes toward blockchain-enabled solutions are shifting, with promises to build practical business applications. Another PwC (2018) survey on 600 executives revealed that 84 percent of organisations are involved with blockchain in some respects, either in research and development or pilot or live projects. Gartner, Inc., a global research and advisory firm, reported that enterprise blockchain has started to climb out of the "trough of disillusionment" phase of the hype cycle, noting that 14 percent of blockchain projects moved into production in 2020 (a rise of 5 percent from 2019) with increases also expected in 2021 (Litan, 2021). Furthermore, several promising blockchain projects have emerged in supply chain management, real-estate, and financial services (Sharma, 2018). Despite the growth of BT in other business activities and the fact that its potential benefits in accounting are

acknowledged by researchers and practitioners, the actual adoption of blockchain in accounting seems to be limited and mostly unreported in the literature.

Most previous studies in the blockchain accounting context are conceptual or descriptive and focus on the potential impact of the technology on accounting and auditing services and the accountancy profession as a whole (Karajovic et al., 2019; Rozario & Vasarhelyi, 2018; Schmitz & Leoni, 2019; Tan & Low, 2019). However, little is known about organisations' perceptions regarding adoption of this technology in the accounting context, and empirical insights are scarce. Hence, this research seeks to bring empirical evidence of the factors influencing blockchain accounting[1] adoption by organisations.

1.2 Context and Problem Statement

Contextually, the central focus of this research is the organisational adoption of BT in accounting. Technology has had a long influence on accounting and auditing services, and over the decades, the advancement of technology has created opportunities for efficient financial reporting (Appelbaum & Nehmer, 2020). Blockchain, another emerging technology, is also expected to have significant implications on accounting and auditing services. The potentiality of blockchain in accounting has been widely discussed in the literature. However, the value of the technology remains more potential than actual. To realise the potential benefits of any technological innovation, it needs to be adopted and diffused (Berg et al., 2018; Iansiti & Lakhani, 2017). The adoption of any new technology poses some challenges for the organisation, and it is pertinent that organisations will consider their needs, possible

[1] Throughout the thesis, blockchain accounting refers to blockchain technology for accounting functions.

advantages, opportunities, and barriers from a holistic perspective before deciding the adoption of any new technology, in this case, blockchain accounting (Gokalp et al., 2020). Blockchain adoption and its determinants have been discussed and examined by prior studies for different sectors and services, such as supply chain management, freight logistics, the public sector, and real estate (Gokalp et al., 2020; Kamble et al., 2019; Saberi et al., 2018; Toufaily et al., 2021; Wong, Leong, et al., 2020; Wouda & Opdenakker, 2019), but it has yet to be explored in the accounting context. Therefore, research is needed to comprehend factors influencing blockchain accounting adoption decision in organisations.

The dearth of empirical research to understand blockchain accounting adoption further highlights the need for empirical evidence in this context. This study is a step forward in this direction, providing empirical insights into the factors affecting organisational level adoption of BT in accounting.

1.3 Research Objective and Research Question

This study aims to gain a comprehensive understanding of the organisational adoption of BT in accounting. For this purpose, the research empirically examines the relevant factors that could impact the organisation's decision to adopt blockchain in accounting. While the literature suggests multiple approaches to understand technology adoption within the organisation, one of the established approaches entails identifying and analysing factors that act as enablers and barriers to the technology adoption decision (Doolin & Troshani, 2007; Jeyaraj et al., 2006; Orji et al., 2020). In order to obtain insights into the research problem, this study aims to explore the decision factors affecting the organisational adoption of blockchain accounting. It is an exploratory attempt to provide qualitative insights into blockchain accounting

adoption by capturing the views of experts and potential users. The research objective leads to the following research question (RQ):

RQ: What factors influence organisations' decision to adopt blockchain technology in accounting?

The research question articulates the research motivation and objective to bring empirical evidence to comprehend blockchain adoption in the field of accounting.

1.4 Theoretical Background

This research selects the technology-organisation-environment (TOE) framework (Tornatzky & Fleischer, 1990) as a theoretical lens to investigate blockchain accounting adoption. The TOE framework is a commonly used framework for technology adoption that illustrates how three varied contextual groups, including technology, organisation, and the environment, affect the organisation's decision to adopt and implement innovations. There are other extensively used theories in technology adoption, such as Technology Acceptance Model (TAM), Theory of Reasoned Action (TRA), Theory of Planned Behaviour (TPB), and Unified Theory of Acceptance and Use of Technology (UTAUT), which typically examine the individual level acceptance of technology (Jeyaraj et al., 2006; Oliveira & Martins, 2011; Williams et al., 2009). As this research is concerned with the organisational adoption of BT in the accounting sphere, technology adoption theories at the organisational level are considered appropriate. Compared to other theoretical perspectives (such as diffusion of innovation (DOI) theory and institutional theory) to study technology adoption in organisations, the TOE framework offers a more comprehensive view of the contextual factors influencing technology adoption in the organisation (Verma & Bhattacharyya, 2017). The framework is also well established in innovation adoption research and has been used to explain the adoption of other technologies such as

enterprise resource planning (ERP) systems (Al-Shboul, 2019; Awa et al., 2017), Extensible Business Reporting Language (XBRL) (Cordery et al., 2011; Doolin & Troshani, 2007), big data (Baig et al., 2019; Verma & Bhattacharyya, 2017), artificial intelligence and robotics (Nam et al., 2020), and cloud computing (Alshamaila et al., 2013; Walther et al., 2018; Yau-Yeung et al., 2020). This further validates the use of the framework in the context of this study.

1.5 Motivation

The core motivation of this study is the lack of empirical evidence in the context of blockchain accounting adoption in organisations. As an emerging technology, blockchain appears to have significant potential for accounting services (Wang & Kogan, 2018). Essentially, it is a distributed, immutable ledger that records and verifies transactions when they occur and distributes the same copy of the ledger to the participating 'nodes' in the network (Iansiti & Lakhani, 2017; Swan, 2015). Therefore, it creates a chain of accounting records instead of retaining separate records and increases the transparency of information for everyone involved (Bonson & Bednarova, 2019; Deloitte, 2016). At the same time, the instantaneous confirmation of transactions by multiple nodes and immutable records could enable nearly real-time verification of accounting information and improve audit quality (Dai & Vasarhelyi, 2017; Rozario & Thomas, 2019). In summary, having the potential of being transparent, decentralised, and traceable, blockchain is thought to be beneficial in the field of accounting. However, the actual use of BT in accounting seems to be very limited by organisations (Deloitte, 2018b). Organisations are still concerned about the performance of BT (Ghode et al., 2020). Moreover, several challenges could impede its utilisation in accounting and auditing (Dai & Vasarhelyi, 2017). Extant literature primarily discussed the implications of the technology in accounting. An empirical

examination of organisation-wide adoption of blockchain accounting with a particular focus on enablers and inhibitors associated with the organisation's adoption decision is insufficiently explored in the literature. Prior research also suggested empirical studies to better understand blockchain adoption in accounting (Bonson & Bednarova, 2019; Moll & Yigitbasioglu, 2019). The present study aims to address this gap in the literature. To the best of the author's knowledge, this is the first empirical study that examines blockchain adoption factors in the accounting context. This research adopts a qualitative approach to gain a comprehensive understanding of blockchain accounting adoption within the lens of the TOE framework. In-depth semi-structured interviews with experts from various backgrounds, including accounting, are analysed to provide insights into the RQ.

This study makes several contributions to the accounting and information system literature. First, the study provides novel empirical evidence of the factors influencing blockchain adoption in accounting from the perspectives of potential users. This research demonstrates the relevance of the TOE framework to the blockchain accounting sphere, as the findings suggest that the adoption decision depends not only on the technology itself but also on other factors internal and external to the organisation. Further, the study adds new aspects to the blockchain adoption literature.

This research also has significant practical implications. It provides useful analysis for managers and business owners about the contextual factors of blockchain accounting adoption, including the benefits and challenges they may face when implementing blockchain accounting projects. The findings can assist organisations to gain a better understanding of adoption barriers and formulating strategies to overcome them. Finally, the results are helpful for both practitioners and the broader accounting

information systems research community alike to understand how context-specific factors influence organisations' decision to adopt BT in accounting.

1.6 Thesis Outline

This thesis is organised into seven chapters. Chapter 1 has outlined the background, statement of the problem, research purpose, theoretical background, and motivation of the study. The research objective is also presented with a relevant research question. Chapter 2 reviews and critically examines the previous literature and establishes the position of this study in the literature. This chapter provides an examination of literature within the context of blockchain, blockchain accounting, and blockchain adoption studies. Chapter 3 presents the theoretical underpinning of this research, exploring the TOE framework and justifying its use in this study. Chapter 4 presents the research methodology, Chapter 5 presents the findings of this study related to the research question, and Chapter 6 critically analyses and discusses the results in light of the extant literature and theory. Chapter 7 concludes the thesis with a summary of the research findings. This chapter also includes a discussion of the theoretical and practical implications of the research, limitations of the study, and areas for future research.

Chapter 2: Blockchain in Accounting

The objective of this chapter is to conduct a comprehensive evaluation of the relevant literature relating to blockchain accounting. This chapter firstly provides a broad overview of the notion of BT, highlighting its key features, types, and how it works (Section 2.1). Next, the chapter evaluates the implications of blockchain in accounting (Section 2.2), potential benefits and challenges of blockchain accounting (Section 2.3), and blockchain-related initiatives by Big Four accounting firms (Section 2.4). This is followed by an analysis of blockchain adoption studies for different business contexts (Section 2.5). Finally, this chapter concludes with a summary of the literature (Section 2.6). Overall, this review of the literature reveals the need for a profound understanding of blockchain adoption in accounting and the need for empirical evidence in this context.

2.1 History and Overview of Blockchain Technology

Blockchain is a distributed database of records or transactions shared among participating parties without any central authority (Crosby et al., 2016; Kokina et al., 2017; Swan, 2015). It is also defined as a secured ledger of transactions, recorded into blocks, chained together chronologically, and distributed across multiple nodes to create reliable provenance (Angelis & Ribeiro da Silva, 2019; Peters & Panayi, 2016). It is decentralised, distributed, and immutable in nature (Attaran & Gunasekaran, 2019; Smith & Castonguay, 2020; Swan, 2015; Yermack, 2017). Unlike a traditional database, BT does not require a centralised processing centre to verify the reliability of the information; instead, it decentralises and distributes the authority among non-trusting users in the network. The system records transactions into anonymised, encrypted blocks, and those blocks are chained together in a linear, chronological order

(Hughes et al., 2019; Peters & Panayi, 2016; Swan, 2015; Yermack, 2017); hence it is termed BT.

In October 2008, an anonymous author using the pseudonym Satoshi Nakamoto first introduced the concept with a paper titled "Bitcoin: A Peer-to-Peer Electronic Cash System" (Crosby et al., 2016; Nakamoto, 2008). The paper delineated a peer to peer network-based online payment system that allows for electronic fund transfer by multiple parties without intermediaries or financial institutions (Nakamoto, 2008). Since then, blockchain has developed via three key phases known as Blockchain 1.0, Blockchain 2.0, and Blockchain 3.0 (Lu, 2018; Swan, 2015). Identifying Blockchain 1.0 through 3.0 and beyond is significant in understanding how the technology is recognised beyond cryptocurrencies for various applications, including accounting.

Blockchain 1.0 primarily comprised cryptocurrencies (such as Bitcoin), with a focus on the issuance, distribution, and transaction of digital currencies in capital markets (Demirkan et al., 2020; Peters & Panayi, 2016). Blockchain 2.0 extended beyond currency to economic, market, and financial applications and introduced the concept of smart contracts (Swan, 2015). Smart contracts are a set of software-driven rules that autonomously verify and execute the terms in the agreement (Peters & Panayi, 2016; Swan, 2015; Zhang et al., 2016). In blockchain-based smart contracts, predefined business logic agreed upon by contractual parties is programmed and stored on the blockchain network (Rozario & Vasarhelyi, 2018). Once users request a transaction, smart contracts activate and verify the information against predefined rules for validating the transaction. If the rules are violated, the transaction remains incomplete with an error message to all participants in the network (Rozario & Vasarhelyi, 2018). Blockchain-based smart contracts contain three unique features, namely autonomy, self-sufficiency, and decentralisation, enabling blockchain to

execute a transaction without the need of intermediaries through encoding pre-specified rules agreed upon by trading parties and decentralising the enforcement power through the blockchain network (Swan, 2015). The autonomous recording of transactions via smart contracts complying with predefined rules has the potential to play a significant role in accounting and auditing services (CPA & AICPA, 2017; Dai & Vasarhelyi, 2017; ICAEW, 2017; O'Leary, 2017). Subsequently, Blockchain 3.0 has evolved beyond currency and finance, with diverse applications in digital identity, electoral systems, supply chains, culture, and art (Swan, 2015). While Blockchain 2.0 largely involved digital finance, Blockchain 3.0 benefits digital society as a whole (Swan, 2015; Zhao et al., 2016). Different industries and human endeavours may be able to reconfigure their operations using the technology (Swan, 2015).

2.1.1 Salient Features of Blockchain Technology

Blockchain has unique features that aim to bring decentralisation, trust, and transparency to the network. These inherent characteristics differ from the traditional database and create an attractive prospect for organisations (Dai & Vasarhelyi, 2017). Figure 2.1 depicts the key features of BT, which are described in more detail below.

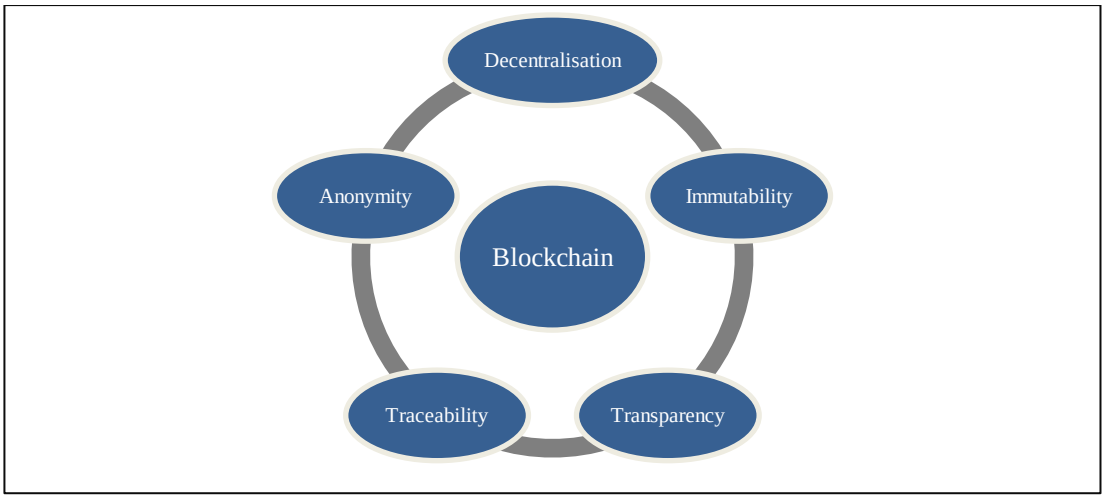

Figure 2.1. Features of Blockchain Technology

Source: Dai et al. (2019); Lu (2019)

Decentralisation: Blockchain uses a decentralised and distributed network of nodes to share information among the participating users by integrating several core technologies such as the cryptographic hash, digital signature, and distributed consensus mechanism (Dai et al., 2019; Nakamoto, 2008; Tian, 2016). Unlike traditional systems, blockchain allows participants to access, verify, and validate the transaction across the network without any intermediaries, thereby could save time and cost, enhance efficiency, and minimise the risk of single-point failure (Dai et al., 2019).

Immutability: Data recorded on a blockchain is considered immutable as the blocks are linked consecutively. Each block in the network receives a timestamp, the previous block's hash value ("parent"), and a nonce, a random number to validate the hash through to the first block ("genesis block") (Nofer et al., 2017). As the new block contains the previous block's information and is chained together, any attempt to alter any block would subsequently require changing the hash value of other blocks. This complicated and sophisticated process creates an immutable ledger of transactions (O'Leary, 2017; Yermack, 2017).

Transparency: The decentralised nature of BT enhances the transparency of the system. Transactions that occur in public blockchain systems are visible to every user in the network. Each node has the permissions and obligations to access authorised information and allows other nodes on the same network to access this information, thus making blockchain data transparent simultaneously, ensuring trust among users through a consensus protocol (Crosby et al., 2016).

Anonymity: Blockchain encrypts data using asymmetric encryption techniques. Transaction data is transmitted over the network with a digital signature to indicate the identity of the signatory; thereby, it is not necessary to disclose the true identity of the

node associated with the participant, which in turn maintains the privacy of the participants (Lu, 2019).

Traceability: In the blockchain network, each block is linked with a unique cryptographic hash function, allowing users to retain the order of transactions and real-time tracking of information (Chen et al., 2018). The traceability feature not only ensures data originality but also reduces the reconciliation need of the transaction across multiple ledgers (Lu, 2019).

2.1.2 Types of Blockchain Technology

The characteristics of BT may vary for different categories of blockchain applications. Current blockchain systems are categorised into three major types: public blockchains, private blockchains, and consortium blockchains (Attaran & Gunasekaran, 2019; Dai et al., 2019).

Public blockchains: Public blockchains are designed to be accessible and verifiable by every party in the network and are most applicable for completely decentralised transactions (Coyne & McMickle, 2017; Dai et al., 2019; Dai & Vasarhelyi, 2017; Yermack, 2017). Transactions recorded in public blockchains are more immutable, traceable, and transparent as every node takes part in the consensus process and keeps a copy of blockchain data (Dai et al., 2019). However, many public blockchains, such as Bitcoin, are slow and resource-intensive due to the high storage and computational power required to ensure transaction security (Dai & Vasarhelyi, 2017).

Private blockchains: Private blockchains restrict the participation and verification of transactions in the network within certain entities approved by administrators (Dai et al., 2019; Pilkington, 2016). This is a centralised blockchain controlled by a single group. Ripple, Everledger, and GemOS are examples of private

blockchain platforms (Dai et al., 2019; Zheng et al., 2017). This type of blockchain is considered suitable for traditional business models such as financial institutions and government (Attaran & Gunasekaran, 2019). Through private blockchain, organisations can share specific accounting records within organisational departments or groups of customers and suppliers. Organisations including the Bank of America, NASDAQ, the New York Stock Exchange, and JPMorgan are testing private blockchains for their transaction and payment systems (Iansiti & Lakhani, 2017). However, information in the private blockchain can be altered as an organisation would have 100 percent control over transaction validation and can also be manipulated through a security breach that would place this same 100 per cent control in the hands of unauthorized individuals (Coyne & McMickle, 2017; Rückeshäuser, 2017).

Consortium blockchains: Consortium or hybrid blockchains, an intermediate form between public and private blockchains, allow for a more equitable distribution of risk and governance among the parties in the network (Sheldon, 2019). While private blockchains grant access control to an organisation, consortium blockchains operate via a consortium of companies, protecting the network from a single-point failure (Duy et al., 2018; Sheldon, 2019). Organisations can use this blockchain to maintain accounting records in a more open platform without embracing public architecture; for example, the Big Four accounting firms have recently joined a consortium of 20 Taiwanese banks to pilot a blockchain-based system for auditing financial reports of public companies (Huillet, 2018). Common instances of consortium blockchain include R3 and EWF (Pilkington, 2016). Table 2.1 presents a comparison of three types of blockchain architecture relating to blockchain characteristics.

Table 2.1 *Comparison of Three Types of Blockchain*

	Decentralisation	**Immutability**	**Efficiency**	**Privacy**	**Permission**	**Example**
Public	Fully decentralised	Immutable	Low	Moderate	Permissionless	Bitcoin
Private	Centralised	Alterable	High	High	Permissioned	Ripple
Consortium or Hybrid	Partially decentralised	Alterable	High	High	Permissioned	R3

Source: Author's elaboration based on Zheng et al. (2018).

2.1.3 How Blockchain Records Transactions

The specific features of BT allow organisations to share ledgers with other participants (such as suppliers, banks, investors, auditors, and other stakeholders) and update ledgers in real-time through peer-to-peer replications. A simple transaction processing system in the blockchain is represented in Figure 2.2.

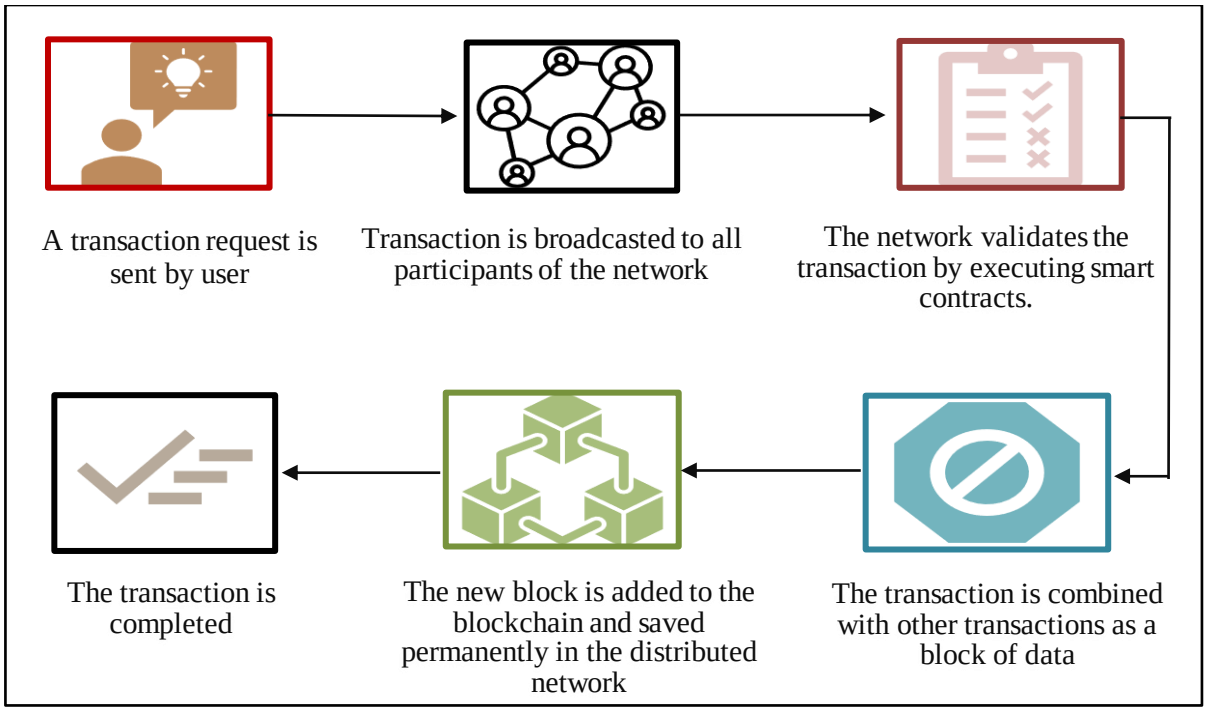

Figure 2.2. Blockchain Transaction Process

Source: Bonson and Bednarova (2019)

In a blockchain system, a person first initiates a transaction to be added to the blockchain. The transaction is protected through a digital signature, signed by the

sender using a 'private key', and sent to the receiver who holds the 'public key' (Crosby et al., 2016). Then it is broadcasted to the network for verification, and the nodes in the network have to agree on the verification process through consensus or mechanisms such as smart contracts (Bonson & Bednarova, 2019). Once the majority of the nodes verify the transaction based on prior rules, the new block is added to the existing chain and represented as a ledger containing transaction history. Each node in the network will receive a copy of this ledger to create a trusting chain, and, finally, the transaction process will be completed. This unique design has led to the belief that blockchain could transform current accounting and auditing services with increased transparency and verifiability of business data (CPA & AICPA, 2017; Dai & Vasarhelyi, 2017). However, to confirm the potential benefits available through a blockchain-based accounting system, it is important to consider factors related to its adoption.

2.2 Blockchain and Accounting Systems

Accounting and auditing services continue to evolve alongside technological innovation. Accounting professionals have been using technological platforms (such as ERP, cloud computing, and XBRL) that create opportunities for improved financial reporting for decades (Appelbaum & Smith, 2018; Debreceny & Gray, 2001; Soni et al., 2018). Recently, the landscape of accounting and auditing has experienced significant technological developments (Bellucci & Manetti, 2017; Troshani et al., 2018). For example, emerging issues deriving from the integration of smart technologies with accounting and auditing appear to reshape organisational accounting practices and procedures (Lombardi et al., 2021). Blockchain, another advancement of technology, is also expected to have significant implications for accounting and auditing services, specifically how information is securely recorded, communicated,

and verified from operations to end-users (Dai & Vasarhelyi, 2017; O'Leary, 2019). It is also viewed as an accounting technology, namely a new type of accounting ledger that can be updated and verified in real-time without the risk of being altered (ICAEW, 2017; Vetter, 2018).

In current accounting systems, transactions involving multiple parties are recorded in separate ledgers that are managed and owned by a central authority. All parties in the system are required to frequently reconcile their ledgers due to the temporary (i.e., timing difference) or permanent (i.e., disputes and errors) discrepancies between the records (Sinha, 2020). Transactions recorded under the current double-entry accounting system require verification by external auditors to confirm their reliability to stakeholders, which is a costly and time-consuming process (Cai, 2021). Moreover, the lag time between the reporting period and the commencement of auditing increases the chances of manipulation and fraud (Cai, 2021). As the transactions are recorded under a central authority, potential manipulation also threatens the trust and transparency of information (Tian, 2016). These drawbacks treat the current system as insufficient against fraud and demand a more transparent accounting information system that can solve the fundamental trust issues among the parties involved (Cai, 2021). The distributed, decentralised, and immutable features of BT have the potential to solve the problems of existing accounting systems and bring new dimensions to accounting and auditing services, such as the triple-entry accounting system (Cai, 2021; Dai & Vasarhelyi, 2017; Karajovic et al., 2019). Triple entry accounting, which originally required transaction processing authorisation from an independent intermediary in addition to parties involved in the transactions, has been discussed for years by academics and professionals (Grigg, 2005; Kiviat, 2015). Blockchain could advance the triple-entry

accounting system as transactions between two parties are recorded in a third party public ledger (Cai, 2021).

Most of the prior studies in the blockchain accounting context examined the consequences of blockchain for accounting practices and the profession as a whole. For example, Bonson and Bednarova (2019), Carlin (2018), Dai and Vasarhelyi (2017), Rozario and Thomas (2019), and Rozario and Vasarhelyi (2018) discussed the potential of the technology for accounting and auditing purposes, explaining how the strengths of the technology could be utilised in practice to improve the current accounting and auditing processes while outlining related challenges. Kokina et al. (2017) suggested achieving a balance between data transparency and privacy for organisational level implementation, and Wang and Kogan (2018) proposed a design framework for a blockchain-based transaction processing system that can provide real-time accounting and continuous monitoring, prevent transaction fraud, and ensure confidentiality. Cai (2021) explored triple-entry accounting using three case studies and concluded that triple-entry accounting with blockchain could increase trust and transparency, ensure better auditability and make the accounting practices more efficient. Moll and Yigitbasioglu (2019) discussed the role of internet-related technologies, including blockchain, in modelling the work of practitioners in three areas of accounting: financial accounting, management accounting, and auditing. Kend and Nguyen (2020) interviewed 20 key stakeholders in the market to comprehend the impact of emerging technologies, including blockchain, on the Australian audit and assurance profession. Their findings surrounding BT suggested rethinking the assumed impact of the technology on auditing, as participants are largely unconvinced regarding its application in the auditing process. Likewise, Karajovic et al. (2019), Fuller and Markelevich (2020), and Tiron-Tudor et al. (2021)

discussed different facets of the impact of BT, with a focus on accounting and auditing organisations.

While the potential benefits and challenges of blockchain regarding accounting and auditing are the subject of several studies (explored in the next section), the present study contributes to this literature by examining organisations' adoption decisions of this technology in the accounting sphere, highlighting the decision factors affecting such adoption.

2.3 Potential Benefits and Challenges of Blockchain in Accounting

Blockchain's unique technical specifications have a range of potential benefits and challenges for accounting practices. The potential benefits of BT include increased trust and transparency of information, real-time reporting, efficient recording, continuous auditing, and reduced human error and fraud (Bonson & Bednarova, 2019; Cai, 2021; Karajovic et al., 2019; Kokina et al., 2017; Moll & Yigitbasioglu, 2019; Rozario & Thomas, 2019). By being decentralised and distributed, BT could provide a shared ledger that allows participants to view an identical copy of the ledger in real-time. As all members have access to the ledger and transactions recorded in blocks are chained together, it is difficult to alter records, particularly for public blockchains. Moreover, the recording of transactions through a consensus protocol and its verification by network participants can potentially shift the trust from an external party to participants in the network (Tan & Low, 2019). Therefore, real-time access to the ledger, consensus protocol to add a transaction in the network, and validation of transactions by network participants leads to an increased level of trust and transparency of accounting information, whereby immutable features make the manipulation or alteration of records theoretically nearly impossible (Deloitte, 2016; KPMG, 2016; Mainelli & Smith, 2015; Swan, 2015). For example, with immutable

records, managers could not adopt strategies to manipulate earnings, such as capitalising cost rather than expense or backdating sales contracts to an earlier reporting period (Yermack, 2017). As another example, to record purchase and payment of inventories, traditional accounting system requires validation of the transaction by multiple departments and authorities, (such as manufacturing manager would ensure the authorisation of the purchase, the warehouse manager would confirm the receipt of inventory with proper quality and quantity), which is time-consuming and prone to potential human error and fraud. In a blockchain-based accounting system, all of these parties, as blockchain nodes, will validate inventory information before it is recorded in the network, optimising time and efficiency while enhancing the reliability of accounting information (Tan & Low, 2019).

Several studies indicated that efficient auditing is one of the key benefits of BT (O'Leary, 2017; Rozario & Thomas, 2019). While in the current auditing process, transactions and balances are verified at the end of the reporting period, a blockchain-enabled auditing system could allow validation of transactions almost immediately (Wang & Kogan, 2018). The instantaneous confirmation of transactions by multiple nodes could facilitate continuous auditing, also referred to as "real-time audit" (Schmitz & Leoni, 2019). Real-time tracking and immutable records create opportunities for proactive auditing in contrast to the traditional retrospective auditing approach (Rooney et al., 2017). By combining the recording with the verification of transactions in real-time, blockchain could facilitate increased efficiency in audit practices in terms of saving time, reducing human error, and ensuring the ease of timely fraud investigation (Kokina et al., 2017; Schmitz & Leoni, 2019). The real-time element of blockchain could also bring substantial efficiencies in the accounting process by eliminating the reconciliation need across multiple ledgers (Karajovic et

al., 2019). Another potential benefit of blockchain accounting mentioned in the literature is that it allows the safe digital transfer of assets backed up with the relevant data and traceable asset history, thus offering transparency within the network (Attaran & Gunasekaran, 2019; Crosby et al., 2016).

Despite the many purported benefits of BT, scholars and professionals also discussed the potential limitations of the technology itself and challenges related to its adoption in accounting. BT's adoption raised concern on issues surrounding cybersecurity and scalability (Karajovic et al., 2019; Rozario & Thomas, 2019; Rozario & Vasarhelyi, 2018). Although the technology is considered immune to hacking and resistant to manipulation, the risks of collusion and the loss or theft of digital wallet private 'keys' entail cybersecurity threats (Rozario & Thomas, 2019). The recording of transactions in the blockchain does not necessarily imply that the transaction has happened in the real world, indicating the need for regulatory support to prevent the misuse of blockchain and smart contracts (Coyne & McMickle, 2017; Dai & Vasarhelyi, 2017). Further, Schmitz and Leoni (2019) argued that blockchain has limited ability to detect fraudulent financial transactions that were fraudulent from the beginning.

Another concern is the scalability of blockchain for financial transactions and other business purposes, particularly for public blockchains (Smith & Castonguay, 2020; Toufaily et al., 2021). Scalability refers to the technology's ability to meet a targeted level of throughput (processing output) as the network grows, such as storage requirements and the response time per transaction (Toufaily et al., 2021). Public blockchain suffers from low transaction processing speed, limiting its utility for large-scale applications (Deloitte, 2018a). For example, the Bitcoin blockchain can process seven transactions per second, which is insufficient for financial institutions that

process thousands of transactions per second (Gilbert, 2016). The low transaction throughput and high consumption of storage and computational resources associated with public blockchains limit its scalability, requiring further development for its widespread adoption across organisations (Dai et al., 2019; Peters & Panayi, 2016).

Coyne and McMickle (2017) highlighted three barriers to blockchain implementation in the accounting domain 1) the desire for confidentiality in the public blockchain, 2) the possibility to manipulate private blockchains, and 3) the limited verification of transactions that the blockchain provides. They argued that organisations might not agree to share their ledger through a public blockchain because of confidentiality concerns; alternatively, they might prefer for private-permissioned blockchain controlled by a central authority. However, private blockchain can be exploited through security breaches, which would put control of the system in the hands of unauthorised persons. Other studies also emphasised the relevance of these challenges for future blockchain adoption in accounting (Bonson & Bednarova, 2019). Furthermore, Dai and Vasarhelyi (2017) discussed blockchain accounting adoption barriers from technological, organisational and environmental perspectives. From a technological perspective, they mentioned that the substantial storage and computation resources and the lack of understanding and knowledge about blockchain-based accounting information systems are the barriers to its adoption. It was also noted that BT needs to be widely adopted to reap its full benefits. For organisational context, the concern raised for organisations' willingness to accept this disruptive technology and the start-up and operating cost related to its adoption. Finally, the environmental context discussed the need for regulatory support to prevent the misuse of blockchain and smart contracts. Table 2.2 provides an overview of the academic literature investigating the potential of BT in accounting.

Table 2.2 *Summary of Literature on Blockchain in Accounting*

Authors	**Focus**	**Research Design**	**Key Findings**
Cai (2021)	Triple-entry accounting with blockchain	Case Study	Benefits: Triple-entry accounting with blockchain will increase trust and transparency of accounting information, ensure better auditability, and facilitate efficient accounting practices.
Lombardi et al. (2021)	Blockchain in auditing	Literature review	Blockchain disruption in auditing is emerging in three key research areas: 1) blockchain as a tool for audit to improve business information systems, save time, and prevent fraud; 2) smart contracts enabling Audit 4.0 efficiency, reporting, disclosure, and transparency; and 3) cryptocurrency and initial coin offerings for corporate governance and new venture financing.
Tiron-Tudor et al. (2021)	Blockchain in accountancy organisations	Literature review	To implement blockchain, its benefits must be emphasised in all accounting and auditing organisations, and managers should formulate strategies to navigate workplace dynamics, skills, personalities, and responsibilities.
Demirkan et al. (2020)	Blockchain potential in accounting and cybersecurity	Literature review	BT will influence accounting and auditing services and will have a significant impact on many companies. The findings suggest various means for implementing BT effectively for various cybersecurity and accounting issues.
Kend and Nguyen (2020)	Impact of emerging technologies on the Australian audit and assurance profession	Qualitative-interview method	In most cases, blockchain audit practices are at the stage of understanding or persuasion, and the findings suggest rethinking the assumed impact of blockchain technologies on audit practices.
Smith and Castonguay (2020)	Impact of blockchain on financial reporting and auditing environment	Conceptual	Organisations, audit committees, and external auditors need to assess increased regulations, governance, and internal control-related issues in utilising blockchain for financial reporting and assurance purposes.
Bonson and Bednarova (2019)	Implication of blockchain on accounting and auditing	Conceptual	The potential challenges of BT in accounting are scalability, flexibility, suitable architecture, and cybersecurity. The incorporation of blockchain

Authors	Focus	Research Design	Key Findings
			into accounting requires a consensus between regulators, auditors, and other parties.
Karajovic et al. (2019)	Implications of blockchain in the accounting profession	Conceptual	Benefits: Triple entry accounting, trustworthy recording, and automated taxation. Challenges: Scalability, cybersecurity, lack of skilled accountants.
Moll and Yigitbasioglu (2019)	Role of internet-related technologies in accountants' work	Literature review	Blockchain and other internet related technologies need to be investigated further to understand the required accounting for firms and determine accountants' competencies and skills.
Rozario and Thomas (2019)	Blockchain-based audit	Conceptual	Benefits: Improved audit quality through an autonomous audit. Increased trust between auditors, financial statement users, and regulators. Challenges: Computational power storage capabilities, cybersecurity risk, litigation risk, the vulnerability of smart contracts, and regulatory acceptance.
Schmitz and Leoni (2019)	BT in accounting and auditing	Literature review	Significant themes: Governance-transparency-trust; blockchain-enabled continuous audits; application of smart contracts; the changing role of accountants and auditors. Benefits: Increased efficiency of recording, reconciling, and auditing, saving time and cost, reducing human error. Challenges: Limited ability to detect fraudulent transactions, wider adoption to maximise the benefit.
Tan and Low (2019)	Blockchain as a database engine and its implications in the accounting system	Conceptual	In a blockchain-based accounting system, the role of accountants and auditors will be changed. The audit is needed to make an opinion on the judgment involved in the financial statements. The technology will strengthen the accounting systems; it does not guarantee a true and fair view of financial statements.
Carlin (2018)	Blockchain-based accounting	Conceptual	BT has the potential to drive the recording process beyond the double-entry paradigm.

Authors	Focus	Research Design	Key Findings
Rozario and Vasarhelyi (2018)	Blockchain-based audit	Conceptual	Benefits: Smart audit procedures based on blockchain and smart contracts will ensure transparent and timely audit reporting and improved audit quality. Challenges: Current statutory requirements, security and privacy, scalability and flexibility, impact on auditor judgement.
Wang and Kogan (2018)	Design a blockchain-based transaction processing system	Conceptual	Propose a design for a blockchain-based transaction processing system that will ensure real-time reporting, continuous monitoring, thus preventing fraud and preserving information integrity.
Coyne and McMickle (2017)	Blockchain-based accounting	Conceptual	Challenges: Desire for confidentiality in public blockchains, possibility of manipulation of private blockchains, limited transaction verification.
Dai and Vasarhelyi (2017)	Implications of blockchain in accounting and auditing	Conceptual	Benefits: Transparency and security, real-time reporting, continuous verification, and automated assurance. Challenges: Substantial storage and resources, unavailable blockchain scheme for accounting, lack of awareness and understanding, scalability, regulatory pressure.
Kokina et al. (2017)	Adoption and implication of blockchain in accounting	Conceptual	Benefits: BT will transform accounting practices by eliminating the need for reconciliation, reducing human error and fraud, ensuring the integrity of information and continuous verification.

The above review of the literature on blockchain accounting shows that blockchain is typically examined concerning its implications, potential opportunities, and challenges for accounting and auditing practices in addition to the profession as a whole. There is a distinct lack of studies in the context of blockchain adoption focusing on enablers and inhibitors associated with the adoption decision. Moreover, most prior studies are exploratory, following either a conceptual or literature review approach, with a particular lack of empirical evidence to understand the adoption decision. This study is an exploratory attempt to provide empirical insights into the factors affecting organisational blockchain accounting adoption.

2.4 Blockchain-related Initiatives by the Big Four Accounting Firms

To better understand the implications of BT in accounting, this research further explores the initiatives and current blockchain practices by Big Four accounting firms (Deloitte, PricewaterhouseCoopers (PwC), Ernst & Young (EY), and KPMG), the largest players in the accounting industry. These firms also significantly influence the accounting profession and are at the forefront of accounting innovation (Cooper & Robson, 2006; Spence et al., 2017). Each of the Big Four firms has engaged in research and development in blockchain and continued their expansion into this technology. The significant blockchain-related developments in Big Four accounting firms are shown in Table 2.3 and detailed below.

Table 2.3 *Blockchain Initiatives by the Big Four Accounting Firms*

2017	• Deloitte conducts blockchain audits. • Deloitte opens new EMEA blockchain lab in Dublin and New York. • KPMG joins the blockchain research institute. • EY launches "Ops Chain" platform and opens a blockchain lab in New York City. • PwC backs blockchain group in Switzerland's "Crypto Valley".
2018	• Deloitte, EY, KPMG, and PwC announce their cooperation with a consortium of 20 Taiwanese banks to pilot a new blockchain-based system for auditing financial reports of public companies. • Deloitte Netherlands launches centre of expertise for blockchain services. • KPMG helps to develop the first blockchain-based airline loyalty program, the "digital wallet". • KPMG announces new US blockchain leadership. • EY announces the launch of the "EY Ops Chain Public Edition" prototype. • EY launches a zero-knowledge system for private transactions on Ethereum. • EY acquires cryptocurrency investment accounting software (CIAS). • EY announces blockchain audit technology. • PwC Australia, Port of Brisbane unveil blockchain supply chain pilot. • PwC tests a blockchain analytics tool for tracking the global footprint of initial coin offering (ICO) tokens.
2019	• Deloitte launches demo blockchain platform "Blockchain in a Box". • Deloitte tests data management on Ethereum blockchain with three Irish banks. • KPMG launches a blockchain-integrated supply chain platform in Australia, China, and Japan. • EY releases a new version of the zero-knowledge proof blockchain to the public domain. • EY blockchain platform supports Blockchain Wine Pty. Ltd. to launch the TATTOO Wine marketplace across the Asia Pacific. • EY launches blockchain tools to help bring accountability to public finances. • PwC launches digital skills training program for employees. • PwC launches a solution supporting the audit of cryptocurrency. • PwC tests blockchain for validating job candidates' credentials.
2020	• KPMG launches a blockchain-based climate accounting system to measure greenhouse gas emissions from companies. • KPMG launches new capabilities to manage crypto/traditional assets in blockchain networks. • Microsoft and EY announce the expansion of blockchain platforms for gaming rights and royalties' management. • EY launches a crypto tax reporting app to assist businesses with US tax filings. • EY launches open-source baseline protocol for the public Ethereum blockchain.

Source: Dow Jones Factiva (2018).

Deloitte: The earliest Big Four player working in the blockchain space, in 2016 Deloitte established a team (Deloitte Rubix) focusing on payments, rewards programmes, and digital banking (Perez, 2015). In 2019, Deloitte introduced a blockchain demo, 'Blockchain in a Box', a solution designed to provide users with a deeper understanding of real-world use cases (Deloitte, 2019). In the same year, it collaborated with three banks in Ireland to start using Deloitte's blockchain solution for verifying employees' credentials. In total, Deloitte's blockchain practice consists of nine development teams with over 500 community members from 30 countries that have developed over 30 blockchain use cases (Deloitte, 2017a). Deloitte also continuously publishes several reports that recognise the benefits of BT in accounting and auditing services in addition to its regulatory uncertainty and scalability issues for mass adoption.

KPMG: In October 2020, KPMG launched a blockchain-based Climate Accounting Infrastructure (CAI) to help organisations achieve sustainability practices by accurately measuring, reporting, and offsetting emissions through real-time environmental data (KPMG, 2020a). To support the growth in institutional adoption of crypto assets and public blockchain, more recently, the company entered into a strategic alliance with Coin Metrics, Inc. and partnered with tech companies Tomia, Microsoft, and R3 for a blockchain-based settlements solution for the telecom industry (KPMG, 2020b). Moreover, the company has a blockchain-based track and trace platform in Australia, China, and Japan to support industries including agriculture, resources, manufacturing, and financial services (Partz, 2019).

EY: Together with Microsoft, EY announced the use of Microsoft's blockchain-based solution for gaming rights and royalties management, such as contract creation, payment and reconciliation (EY, 2020a). This blockchain solution can reduce Xbox

payment times and enable near real-time royalty calculation with greater visibility and transparency. In 2020, EY also launched a new public domain blockchain tool, baseline protocol, in cooperation with ConsenSys and Microsoft. The protocol will allow businesses to create and deploy procurement and other business processes on the public Ethereum blockchain more securely and privately (EY, 2020b).

PwC: PwC executes major training programs to improve its employees' technological competence (O'Neal, 2019). In June 2019, it ran a pilot project using BT to validate a job candidate's credentials with an aim to expedite the selection process (Castellanos, 2019). In the same year, PwC unveiled a new audit tool for cryptocurrency transactions that gathers information about blockchain transactions and balances while providing evidence of private-public key pairing (Baydakova, 2019).

To date, all of the Big Four firms have demonstrated their interest and taken initiatives in blockchain and blockchain-enabled business practices. Their presence and initiative in the blockchain accounting space can be considered a reflection of the state of future blockchain accounting adoption (O'Neal, 2019).

2.5 Blockchain Adoption Studies

Research interest in the area of BT has been steadily increasing alongside the development of the technology, with a focus on blockchain adoption and acceptance by organisations and individuals. For example, Saberi et al. (2018) discussed blockchain adoption in the supply chain context by critically examining and categorising adoption barriers in the organisation. Wang et al. (2016) proposed a maturity model for blockchain adoption and discussed the adoption process following the commonly used capability maturity model. Likewise, Pu and Lam (2020) examined blockchain adoption for the maritime industry, developing a conceptual

framework of five dimensions to critically evaluate their impacts on the blockchain adoption process. Similarly, Janssen et al. (2020) proposed a conceptual framework based on a review of the extant literature, which captures the relationship between institutional, market, and technical factors influencing blockchain adoption in organisations. Recently, in addition to the above conceptual and review studies, blockchain adoption has also been empirically investigated for different sectors, particularly in the areas of supply chain and logistics management. Table 2.4 summarises the previous empirical research on blockchain adoption.

Table 2.4 *Summary of Empirical Studies on Blockchain Adoption*

Author	Adoption Context	Theoretical Perspective	Factors Identified
Balasubramanian et al. (2021)	Organisation-Healthcare sector	n.a.	Organisation size, government readiness, lack of regulatory clarity, privacy, and trust issues.
Malik et al. (2021)	Organisation- Australian context	TOE framework; Institutional theory	Technological: Perceived novelty, perceived complexity, perceived cost, and disintermediation. Organisational: Top management knowledge, top management support. Environmental: Government support, customer pressure, consensus among trading partners, and trading partner readiness.
Toufaily et al. (2021)	Organisation- Public and private sectors	DOI theory; TOE framework	Technological: Immature technology, security, privacy, cost, scalability and performance, interoperability, complexity, and relation to cryptocurrencies. Environmental: Regulatory uncertainty, network effects and inter-organisational connectedness, and ecosystem readiness. Organisational: governance and leadership, business model alignment, and organisational readiness.
Gokalp et al. (2020)	Organisation- Supply chain management	TOE framework	Technological: Relative advantage, complexity, compatibility, standardisation, scalability, and trust. Organisational: Organisations' IT resources, top management support, organisation size, and financial resources. Environmental: Competitive pressure, trading partner pressure, government policy and regulations, and inter-organisational trust.
Koster and Borgman (2020)	Organisation- Public Sector	Extended TOE framework	Technological: Hype around - and resistance to - blockchain technology. Organisational: Top management support. Environmental: Regulatory environment. Inter-organisational context: Trust among parties.

Author	Adoption Context	Theoretical Perspective	Factors Identified
Kulkarni and Patil (2020)	Organisation- Financial services	TOE framework	Technological: Perceived compatibility, perceived cost, relative advantage, and perceived security. Organisational: Firm scope, learning culture, and top management. Environmental: Competitive pressure, government policies, and consumer readiness.
Orji et al. (2020)	Organisation-Freight logistics industry	TOE framework	Technological: Availability of blockchain tools, infrastructural facility, complexity, perceived benefits, compatibility, security, and privacy. Organisational: Training facilities, top management support, firm size, capability of human resources, perceived costs of investment, and organisational culture. Environmental: Government policies, competitive pressure, institutional-based trust, market turbulence, and stakeholder pressure.
Wong, Tan, et al. (2020)	Individual-Malaysian supply chain context	UTAUT	Facilitating condition, technology readiness, technology affinity, and regulatory support.
Wong, Leong, et al. (2020)	Organisation- Supply chain management among Malaysian SMEs	TOE framework	Technological: Relative advantage, and complexity. Organisational: Cost. Environmental: Competitive pressure.
Hoxha and Sadiku (2019)	Organisation- Real estate	Transparency theory; Transaction cost theory; Transaction process theory	Transparency, cost reduction, and security.
Kamble et al. (2019)	Individual- Supply chain in India	TAM; TPB	Perceived usefulness, attitude, perceived behavioural control, and subjective norms.

Author	Adoption Context	Theoretical Perspective	Factors Identified
Queiroz and Wamba (2019)	Individual- Logistics and supply chain management in India and the USA	UTAUT	Facilitating conditions, performance expectancy, social influence, and trust of supply chain stakeholders.
Holotiuk and Moormann (2018)	Organisation	n.a.	Technology, organisation, people, project management, and environment.

n.a.- Not applicable

TOE framework- Technology-Organisation-Environment framework

DOI- Diffusion of Innovation

UTAUT- Unified Theory of Acceptance and Use of Technology

TAM- Technology Acceptance Model

TPB- Theory of Planned Behaviour

As can be seen in Table 2.4, empirical blockchain adoption research is predominantly focused on identifying factors that influence adoption decisions and can be broadly categorised into individual adoption intention (Kamble et al., 2019; Queiroz & Wamba, 2019; Wong, Leong, et al., 2020) and organisational adoption decision (Gokalp et al., 2020; Hoxha & Sadiku, 2019; Koster & Borgman, 2020; Kulkarni & Patil, 2020; Malik et al., 2021; Orji et al., 2020; Toufaily et al., 2021; Wong, Tan, et al., 2020). Prior studies also examined blockchain adoption in different contexts, including supply chain management (Orji et al., 2020; Queiroz & Wamba, 2019; Wong, Leong, et al., 2020), information systems (Holotiuk & Moormann, 2018; Malik et al., 2021), the public sector (Koster & Borgman, 2020), financial services (Kulkarni & Patil, 2020), health sector (Balasubramanian et al., 2021), and real-estate sector (Hoxha & Sadiku, 2019).

In the context of supply chain management, several empirical studies provided country-specific evidence of factors affecting individual intention to adopt BT, including in Malaysia (Wong, Tan, et al., 2020), India (Kamble et al., 2019), and the USA (Queiroz & Wamba, 2019). For instance, an empirical study by (Kamble et al., 2019) revealed that perceived usefulness, attitude, perceived behaviour control, and subjective norms affect BT implementation intention in the supply chain of India. By adopting the UTAUT model, Queiroz and Wamba (2019) demonstrated important differences in blockchain adoption behaviour across India and the USA. The individual-level adoption theories (such as TAM, TPB, and UTAUT) were typically utilised to investigate the individual adoption intention of BT. Previous research also examined organisational level adoption of blockchain-based supply chain management, with a particular focus on identifying determinants of adoption based on prominent organisational innovation adoption theories such as the TOE framework,

DOI theory or institutional theory (these theories are discussed in detail in Chapter 3). For example, Gokalp et al. (2020), in their investigation of adoption determinants of blockchain-based supply chain systems, revealed that environment-related factors are more influential than technological or organisational determinants. They argued that there is a need for common supply chain management systems to exchange information in the network; thereby, environmental dynamics are more critical for transitioning into a blockchain-based supply chain system. In a similar empirical study using TOE models for Malaysian SMEs, Wong, Leong, et al. (2020) found that influential blockchain adoption factors include the relative advantage that organisations will achieve from the technology, the higher cost of implementing the technology, the competitive pressure to be innovative, and the complexity related to BT and its implementation. Further, using artificial neural network analysis, they showed that competitive pressure is the key driver of adoption intention.

The challenges and implications of blockchain adoption were also empirically investigated for the public sector. For example, by analysing the seven blockchain projects relevant for the public sector, Koster and Borgman (2020) showed that blockchain adoption is affected by the hype around and resistance to BT, top management support, regulatory environment, and trust between blockchain partners. In the same vein, Toufaily et al. (2021) developed a conceptual framework of adoption factors using the TOE model, showing the inter-relationship between adoption challenges and the expected values of blockchain adoption.

The possibility of mainstream adoption of blockchain has also been examined in terms of the impact of technological, organisational, and environmental factors on organisations' blockchain adoption intention (Holotiuk & Moormann, 2018; Malik et al., 2021).

Overall, it is apparent from the literature that blockchain has received growing interest among researchers to understand its applicability and acceptance in different contexts. Past studies have examined blockchain adoption both from individual and organisational perspectives. However, for a background technology like blockchain, individuals have limited choice to select the technology; rather, its acceptance and adoption by organisations is more relevant.

Moreover, it is worth noting that while blockchain adoption has been theoretically studied and empirically examined for different services, sectors, and geographic locations, research in the area of accounting remains under-explored. There is a lack of theory-driven empirical research to explore blockchain adoption in the accounting environment. Researchers also encouraged the collection of primary data to obtain a better understanding of BT adoption (Risius & Spohrer, 2017) and suggested a comprehensive, empirically grounded investigation that will address multiple independent actors (Toufaily et al., 2021). The present study aims to address this concern from the accounting perspective.

2.6 Summary and Implications

This chapter reviewed the literature on BT, its implications for accounting, and blockchain adoption studies in multiple settings. This review has revealed the different features and concepts of the technology itself and how it impacts accounting and auditing services. The potential benefits and challenges of blockchain-based accounting systems are well-documented in the literature. The Big Four accounting firms have taken a range of blockchain initiatives, highlighting the importance of blockchain adoption in the accounting sphere. Overall, the review of existing studies on blockchain adoption provides valuable insights and justification for conducting the current research. Figure 2.3 positions this research within the extant literature.

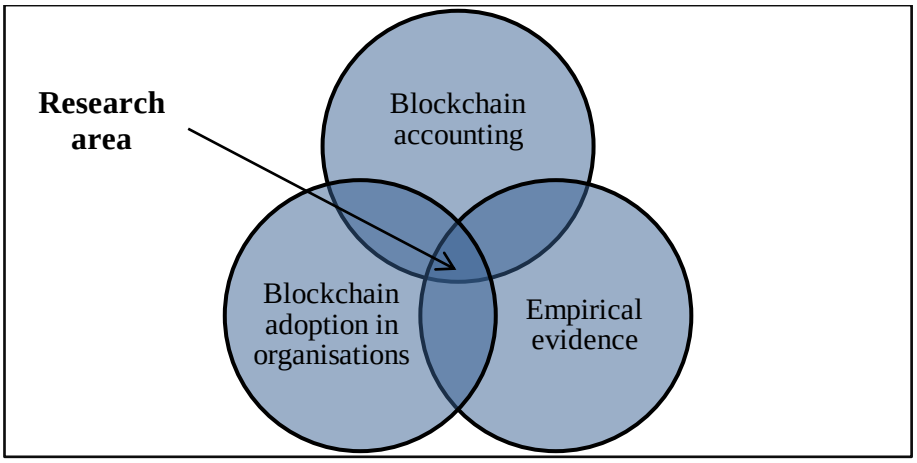

Figure 2.3. Empirical Evidence of Blockchain Accounting Adoption in Organisations.

The growing literature on blockchain accounting demonstrates its potential for accounting and auditing processes. However, the value of the technology remains more potential than actual. The actual adoption of blockchain accounting by organisations seems to be very limited and mostly unreported. Therefore, this study seeks to identify the drivers of organisational adoption of BT in accounting.

The majority of previous research relating to blockchain accounting is conceptual, descriptive, or design-oriented, with a particular lack of theory-driven empirical research. While there is a growing number of empirical studies exploring blockchain adoption in different sectors, little is known about its adoption in the accounting context, and empirical insights are scarce. This research is, therefore, an exploratory attempt to provide qualitative insights into organisational adoption of blockchain accounting by highlighting the factors that could drive or inhibit the adoption decision.

Chapter 3: Theoretical Background

This chapter describes the theoretical framework underpinning the research. As this research is concerned with the organisational adoption of BT in accounting, technology adoption theory at the organisational level is considered appropriate. Technology adoption theories explain individuals or organisations' intention or behaviour to adopt technologies in a particular situation (Fichman, 2004). This study utilised the technology-organisation-environment (TOE) framework of Tornatzky and Fleischer (1990) to explore factors associated with blockchain accounting adoption in organisations.

The content of this chapter is organised into five sections. Section 3.1 presents the existing innovation adoption theories leading to the rationale for using the TOE framework for this study. Section 3.2 provides an overview of the TOE framework and Section 3.3 reviews studies using the framework for different technological domains. Section 3.4 justifies the adoption of the framework for the current study. Finally, Section 3.5 concludes the chapter.

3.1 Existing Technology Adoption Theories

Technology plays an important role in attaining sustainable competitive advantages, including increased productivity and efficiency in the organisation (Chandio et al., 2017). However, technology adoption is a complex, context-sensitive process (Wolfe, 1994). One of the common approaches to providing insights into the technology adoption phenomenon involves the identification of factors influencing such adoption (Allen, 2000; Fichman, 2004; Jeyaraj et al., 2006; Kwon & Zmud, 1987). Researchers have proposed several theories to examine factors that affect

technology adoption at the individual and organisational level (Jeyaraj et al., 2006; Sabherwal et al., 2006).

Prominent theories to investigate the individual level acceptance of technology include the theory of reasoned action (TRA) (Ajzen & Fishbein, 1980), theory of planned behaviour (TPB) (Ajzen, 1991), technology acceptance model (TAM) (Davis, 1989), and unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003). This group of theories typically examine the individual's behavioural intention or actual adoption behaviour by assuming that beliefs drive attitudes, which further influence intentions and technology adoption (Jeyaraj et al., 2006). Moreover, these theories propose different types of variables related to the individual, innovation, and organisation to explain the individual adoption of technology (Jeyaraj et al., 2006). Alternatively, for analysing technology adoption at the organisational level, commonly used theories in the literature include institutional theory (DiMaggio & Powell, 1983), the technology-organisation-environment (TOE) framework (Tornatzky & Fleischer, 1990), and diffusion of innovation (DOI) theory (Rogers, 1995). These theories generally focus on organisations' decision to adopt (Grover, 1993), intention to adopt (Plouffe et al., 2001), intention to use (Agarwal et al., 2000), and diffusion (Jeyaraj et al., 2006) of technology by examining specific stages in adoption or different factors associated with the adoption (Jeyaraj et al., 2006). Table 3.1 summarises the existing technology adoption theories.

Table 3.1 *Overview of Technology Adoption Theories*

Adoption Level	Theory	Focus	Authors
Individual Level	TAM	Three core determinants: Perceived usefulness, perceived ease of use, and external variables.	Davis (1989)
	UTAUT	Four key determinants: Performance expectancy, effort expectancy, social influence, and facilitating conditions.	Venkatesh et al. (2003)
	TPB	Propose four determinants: Attitude toward the behaviour, subjective norms, perceived behavioural control, and behavioural intention.	Ajzen (1991)
	TRA	Three key factors: Attitude towards behaviour, behavioural intention, and subjective norms.	Ajzen and Fishbein (1980)
Organisational Level	Institutional Theory	Three key pressures of the external environment: Mimetic pressure, coercive pressure, and normative pressure.	DiMaggio and Powell (1983)
	TOE	Three contexts: Technology, organisation, and environment.	Tornatzky and Fleischer (1990)
Individual and Organisational Level	DOI	Individual characteristics and organisational characteristics.	Rogers (1995)

As this research is concerned with the organisational adoption of blockchain accounting, technology adoption theories at the organisational level are discussed. Institutional theory is used to understand how a particular social behaviour is initiated, diffused, and changed over time and space in order to meet socially acceptable values in organisations (DiMaggio & Powell, 1983). This theory highlights the role of the institutional environment in shaping organisational actions (Scott, 1995). In the

context of technology adoption, the institutional theory argues that the adoption of technology is affected by external pressures emerging from the external environment, suggesting that institutional decisions are not only driven by organisational goals but also by other social factors; for example, pressure from competitors, customers, trading partners, governments, and professional groups (DiMaggio & Powell, 1983; Oliver, 1997). This theory provides a profound understanding of technology adoption in organisations under external pressures (Son & Benbasat, 2007). However, the theory is limited to only external environmental factors, ignoring the impact of technological and organisational aspects of technology adoption in organisations (Delmas & Toffel, 2008; Lounsbury & Crumley, 2007).

Alternatively, the DOI theory by Rogers (1995) explains adoption behaviour in both individual and organisational domains. According to Rogers (1995), DOI is a process-based framework to explain how, why, and at what rate individuals or organisations adopt the technology. DOI contributes to the understanding of technology adoption by describing the diffusion of the innovation process and analysing a set of determinants affecting the innovation (Al-Zoubi, 2013; Jeyaraj et al., 2006). The limitation of the DOI theory is that it emphasises the technological and organisational factors and tends to ignore the environmental aspects of the technology adoption (Verma & Bhattacharyya, 2017). Organisations' adoption decisions may be influenced by the external environment (such as government, competitors, and trading partners) in addition to characteristics of the technology and organisation (Al-Zoubi, 2013). In this regard, the TOE framework offers a comprehensive tool for studying technology adoption at the organisational level, complementing the DOI theory with a third perspective (Mohtaramzadeh et al., 2018; Verma & Bhattacharyya, 2017). This

study used the TOE framework as a theoretical lens to analyse data and identify factors that influence the organisation's decision to adopt BT in accounting.

3.2 The Technology-Organisation-Environment (TOE) Framework

The TOE framework was developed by Tornatzky and Fleischer (1990) to illustrate how different organisational contexts influence the decision to adopt and implement innovation. It demonstrates that three varied contextual groups, namely technology, organisation, and environment, influence the organisation's innovation adoption decision. Previous researchers acknowledged the TOE as a multi-perspective framework that provides a strong basis for analysing multiple factors of technology adoption across different types of organisations (Gangwar et al., 2015; Verma & Bhattacharyya, 2017; Yeh & Chen, 2018). However, the specification of factors within the three contexts varies across different studies and technologies (Wang & Wang, 2016). The present study applies the framework to the blockchain context with particular reference to blockchain adoption in accounting. Figure 3.1 presents the original form of the TOE framework. The three contexts of the framework are discussed in detail in the following subsections.

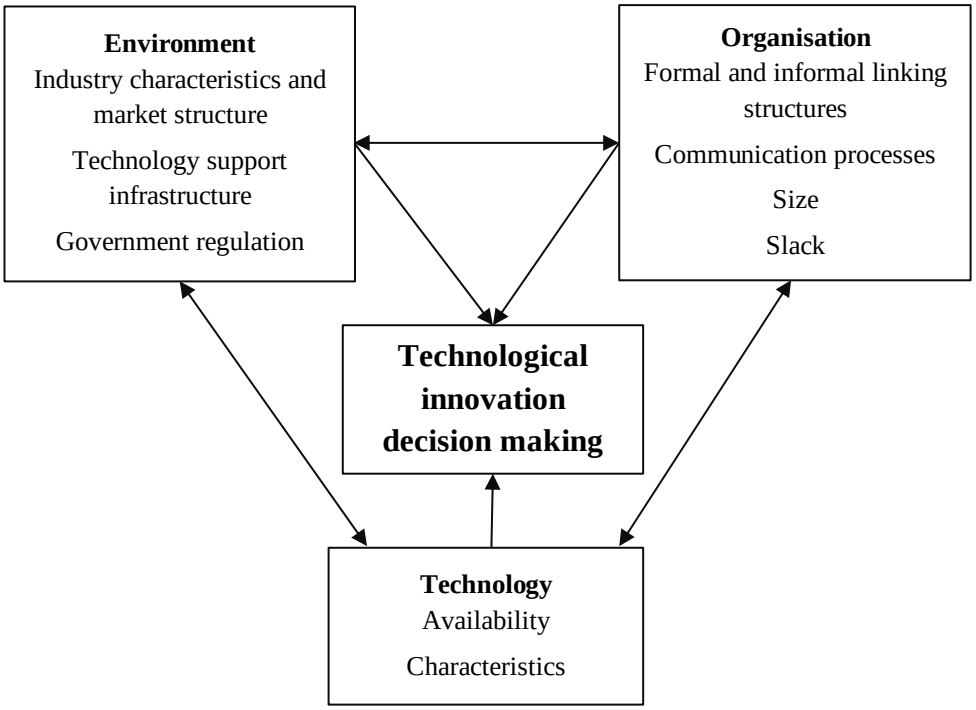

Figure 3.1. Technology-Organisation-Environment Framework

Source: Tornatzky and Fleischer (1990).

3.2.1 Technological Context

Technological context represents internal and external technologies applicable to the organisation to achieve its business objectives (Tornatzky & Fleischer, 1990). Internal technologies describe technologies and equipment currently used by the organisation, while external technologies include technologies available to the organisation but not currently used (Tornatzky & Fleischer, 1990). As per Depietro et al. (1990), the technological dimension focuses on how the attributes of the technology could influence the adoption decision. These include the relative advantage of the technology (Hsu et al., 2014; Karunagaran et al., 2017), cost involved in the adoption process (Alshamaila et al., 2013; Verma & Bhattacharyya, 2017), the technology's compatibility with the organisation's needs and existing systems (Premkumar et al., 1994; Senyo et al., 2016), and complexity related to the technology and its adoption (Gutierrez et al., 2015; Niederman, 1998). Moreover, internal technological aspects,

such as the organisation's IT infrastructure and operations, have a significant impact, possibly creating barriers to technology adoption (Depietro et al., 1990). In this study, to explain the organisation's blockchain accounting adoption, the technological context concentrated on BT characteristics and experiments with the technology in addition to organisations' technical architecture and network infrastructure.

3.2.2 Organisational Context

Organisational context refers to factors relating to the organisation itself (such as characteristics and resources) affecting organisations' readiness to adopt innovation (Chwelos et al., 2001; Kuan & Chau, 2001; Tornatzky & Fleischer, 1990). These include formal and informal organisational structures, which consequently leads to other aspects, such as size, centralisation, formalisation, and complexity of management structures (Tornatzky & Fleischer, 1990). The availability of resources (such as capital, expertise, and people) and the organisation's ability to manage and reallocate available resources can facilitate innovation adoption and diffusion decisions (Chau & Hui, 2001; Depietro et al., 1990). Similarly, an organisation's acceptance (Chau & Hui, 2001; Fillis et al., 2004) and top management support (Grover, 1993) may have positive influences on the technology adoption decision. Furthermore, this context considers the types of communications within the organisation, and between the organisation and its external environment, as an essential component of innovation adoption (Depietro et al., 1990).

3.2.3 Environmental Context

Environmental context refers to the setting in which the organisation performs its day-to-day business operations, namely its industry, competitors, government interaction, and the regulatory environment (Hsu et al., 2014; Tornatzky & Fleischer, 1990). The environment creates both opportunities and threats to the organisation's

intention to engage in technological adoption (Hsu et al., 2014; Raymond, 2001). For example, the greater the intensity of competition in an industry, the higher the pressure on an organisation to adopt alternative technologies to gain or sustain competitive advantage (Chwelos et al., 2001; Karunagaran et al., 2017). Influence from trading partners is also considered important for the adoption of technologies, such as E-market, cloud computing, and electronic data exchange (EDI) (Duan et al., 2012; Gutierrez et al., 2015; Iacovou et al., 1995). Government can influence innovation adoption through supportive policies and announcements, provision of incentives and support (Kuan & Chau, 2001), or through economic, social, and institutional regulatory requirements (Blind et al., 2017; Depietro et al., 1990).

3.3 Studies Applying the TOE Framework

The use of the TOE framework in studying the adoption of technology at the organisational level is well-documented in the existing literature (Table 3.2).

Table 3.2 *TOE Framework-based Technology Adoption Studies*

Authors and Year	**Technology-focused**	**Technological Factors**	**Organisational Factors**	**Environmental Factors**
Gokalp et al. (2020)	Blockchain technology	Relative advantage, complexity, compatibility, standardisation, scalability, trust.	Organisations' IT resources, top management support, organisation size, financial resources.	Competitive pressure, trading partner pressure, government policy and regulations, inter-organisational trust.
Nam et al. (2020)	Artificial intelligence and robotics	Relative advantage, complexity, external IT expertise, internal IT expertise.	Market position, financial justification, resistance by employees.	Customer readiness, customer expectation, competition, legal issues.
Orji et al. (2020)	Blockchain technology	Availability of specific blockchain tools, infrastructural facility, complexity, perceived benefits, compatibility, security, privacy.	Presence of training facilities, top management support, firm size, capability of human resources, perceived costs, organisational culture.	Government policies, competitive pressure, institutional-based trust, market turbulence, stakeholder pressure.

Authors and Year	Technology-focused	Technological Factors	Organisational Factors	Environmental Factors
Siew et al. (2020)	Computer-assisted audit tools and techniques (CAATTs)	n.a.	Firm size, top management commitment, employee IT competency.	Complexity of clients' accounting information systems, perceived level of support of professional accounting bodies.
Clohessy and Acton (2019)	Blockchain technology	n.a.	Top management support, organisational readiness, organisation size.	n.a.
Karunagaran et al. (2017)	Cloud computing	Relative advantage, compatibility, complexity, ease of use, trialability, technology integration.	Firm size.	Competitive intensity, regulatory support.
Verma and Bhattacharyya (2017)	Big data analytics	Complexity, compatibility, IT assets.	Top management support, organisation data environment, perceived costs.	External pressure, industry type.
Awa and Ojiabo (2016)	Enterprise resource planning (ERP) software	Technology (ICT) infrastructure, technical know-how, perceived compatibility, perceived value, security.	Organisation-demographic composition, size, scope of business operations, subjective norms.	Competitive pressure, external support, trading partners' readiness.

Authors and Year	Technology-focused	Technological Factors	Organisational Factors	Environmental Factors
Kashi et al. (2016)	Social recruiting technologies	Perceived benefits, complexity, compatibility.	Top management support, HRM configuration, social media policy, human resource capabilities, organisational readiness.	Application readiness, critical mass.
Senyo et al. (2016)	Cloud computing	Relative advantage, security concerns, compatibility.	Firm size, firm scope, top management support, technology readiness.	Competitive pressure, regulatory support, trading partners' pressure.
Wang and Wang (2016)	Knowledge management systems	Perceived benefits, complexity, compatibility.	Top management support, organisational culture.	Competitive pressure.
Gutierrez et al. (2015)	Cloud computing	Relative advantage, compatibility, complexity.	Top management support, firm size, technology readiness.	Competitive pressure trading partner's pressure.
Hsu et al. (2014)	Cloud computing	Perceived benefits, business concerns.	IT capability.	Trading partners' pressure, competitive pressure, regulations, and government policies.
Lin (2014)	Electronic supply chain management system	Perceived benefits, perceived costs.	Top management support, absorptive capacity.	Competitive pressure.

Authors and Year	Technology-focused	Technological Factors	Organisational Factors	Environmental Factors
Oliveira et al. (2014)	Cloud computing	Technological readiness.	Top management support, firm size.	Competitive pressure, regulatory support.
Duan et al. (2012)	E-market	Perceived direct benefit, perceived indirect benefit.	Firm size, top management support, organisation readiness.	External pressure, E-market trust, trading partner trust.
Cordery et al. (2011)	XBRL	Relative advantage, compatibility, complexity.	Top management support, organisation champion, organisation size and resources.	Market competition, trading partners, regulators and government, availability of information and support.
Low et al. (2011)	Cloud computing	Relative advantage.	Top management support, firm size.	Competitive pressure, trading partner pressure.
Doolin and Troshani (2007)	XBRL	Relative advantage, complexity, trialability/observability, stability.	Innovation support, organisational readiness.	Market conditions, trading partner influence, available information, critical mass, available support.

A review of the literature revealed that the framework has been extensively applied for various technologies to understand their adoption behaviour in organisations. For example, Awa and Ojiabo (2016) used the TOE framework to investigate the determinants for adopting ERP systems by small and medium-sized enterprises, finding a strong influence of technological factors compared to organisational and environmental factors. Verma and Bhattacharyya (2017) examined factors affecting big data analytics (BDA) adoption for Indian firms within the TOE framework, recognising the significant influence of the strategic value of BDA, complexity, compatibility, IT assets, top management support, organisation data environment, perceived costs, external pressure, and industry type. Oliveira et al. (2014) applied the TOE framework to assess cloud computing adoption by firms in Portugal, leading to the identification of technological readiness, top management support, firm size, competitive pressure, and regulatory support as the key determinants for cloud computing adoption. Iacovou et al. (1995) investigated the determinants of EDI adoption within the TOE framework, identifying perceived benefit, organisational readiness, and external pressure as critical factors. Wang and Wang (2016) used the same framework to model the factors that facilitate and inhibit the implementation of knowledge management systems. Nam et al. (2020) explored the adoption of artificial intelligence and robotics in the hotel industry, revealing that relative advantage, complexity, IT expertise, market position, financial justification, employee resistance, customer readiness, customer experience, competition, and legal issues are key TOE factors.

The applicability of the TOE framework is also demonstrated for BT adoption. For example, Gokalp et al. (2020) applied the framework to explore determinants of the adoption of blockchain-based supply chain systems in organisations, identifying

relative advantage, complexity, compatibility, standardisation, scalability, and trust as significant determinants. Orji et al. (2020) further confirmed the relevance of the TOE framework in a study of the adoption of blockchain in the freight logistics industry. Their findings indicated that the availability of specific blockchain tools, infrastructural facilities, and government support are the most influential factors of blockchain adoption in the freight logistics industry. Malik et al. (2021) illustrated the applicability of the TOE framework in their study on BT adoption in Australia using a qualitative interview approach. Similarly, Wong, Leong, et al. (2020) demonstrated the suitability of the framework for studying blockchain adoption in supply chain management for Malaysia.

Overall, the TOE framework is widely used as the theoretical basis to identify factors affecting technology adoption in organisational settings. The suitability of the framework is epitomized in the existing literature across different technologies, industries, and sectors. Its applicability is also exemplified in the context of blockchain. Thus, this study used this threefold context framework to analyse data and identify factors that influence an organisation's blockchain accounting adoption decision.

3.4 Justification for Using the TOE Framework

This research adopted the TOE framework for several reasons. First, there are several technology adoption theories (such as UTAUT, TRA, TPB, and TAM) primarily focused on the individual acceptance of technology. For accounting, blockchain is more likely to be used as background technology. In this context, users have limited choice to select a technology. Therefore, the organisation's acceptance and adoption are considered more relevant than the user's individual choice. Considering the organisational adoption of blockchain accounting, technology

adoption theories at the organisational level are emphasised. While the institutional theory is used to explain innovation adoption in organisations, it mainly focuses on the role of external environmental pressure on the adoption decision. DOI theory is also applied to examine an organisation's technology adoption process but is limited to technological and organisational aspects. As the decision to adopt technology in an organisation depends on a variety of internal and external factors, the TOE framework offers a more comprehensive approach by considering the aspects of technology, organisation, and environment (Mohtaramzadeh et al., 2018). Combining human and non-human factors into a single framework provides better strength over other models (Awa et al., 2017). For this study, the TOE framework serves as a useful analytical tool to explore blockchain's inherent qualities, organisations' motivation, capability, and culture, and the influence of the external environment for blockchain accounting adoption in organisations. Second, the framework is flexible, allowing application to different technological, sectoral, and geographical contexts with reasonable explanatory power (Nilashi et al., 2016) and for the integration of new factors (Baker, 2012). Thus, it offers a good starting point to understand and analyse the adoption of blockchain in accounting, an under-explored research area. Third, there is empirical support to illustrate that the framework is strongly applicable for organisational level examination of innovation adoption (Hameed et al., 2012). It is therefore considered appropriate to investigate blockchain accounting as an innovation to be adopted at the organisational level. Finally, the extensive application of the TOE framework in technology adoption studies involving a variety of technologies (including blockchain) and the similarity of the context of this study have motivated the researcher to employ the framework for examining organisational adoption of blockchain accounting.

3.5 Summary and Implications

This chapter explained the theoretical framework of this research and outlined its applicability for the current study. The TOE framework as an innovation adoption theory explores opportunities and challenges of technological innovation within three contexts, thereby enabling a comprehensive examination of the determinants of technology adoption. This framework was employed in prior studies for a range of different technologies, including ERP, BDA, cloud computing, audit software, and other innovation domains. It has also been applied in relation to BT. Following calls for its wider applicability in innovation domains (Gokalp et al., 2020; Orji et al., 2020; Thong, 1999; Zhu et al., 2003), this study adopted the TOE framework to explore factors that facilitate or inhibit organisational adoption of blockchain accounting. Through the application of this comprehensive theoretical framework, this research aims to provide relevant and deeper insights into the phenomenon under investigation.

Chapter 4: Research Methodology

The objective of this research is to provide insights into the organisational adoption of BT in accounting by exploring relevant factors affecting the adoption decision through an exploratory research design. This study adopted an exploratory qualitative approach using in-depth semi-structured interviews to yield an enriched, comprehensive understanding of blockchain adoption in accounting.

This chapter describes the research methodology, data collection, and analysis procedures focusing on instruments, participants, sampling process, and coding mechanism. The chapter is organised in the following sections. Section 4.1 describes the qualitative research method used for the study. The details of data collection are outlined in Section 4.2, highlighting the instruments used, participants, sampling process, and data collection procedures. Section 4.3 presents the data analysis process. The reliability and validity of the research are described in Section 4.4, followed by ethical considerations in Section 4.5. Finally, Section 4.6 concludes the chapter.

4.1 Qualitative Research Method

Research methodology describes a systematic plan to solve a research problem concerned with defining research questions, selecting the research method, determining the sample, and collecting and analysing data using a particular technique (Kothari, 2004). The selection of appropriate methodology improves research outcomes and provides researchers with a plan and guidelines to achieve the research objective and complete the project on time (Creswell & Plano Clark, 2018). As an exploratory research design aiming to gain a comprehensive understanding of the organisational adoption of BT in accounting, particularly by identifying factors

influencing such adoption, this study adopted a qualitative research method using an in-depth semi-structured interview approach.

Qualitative research provides us with insights into the meanings participants attribute to the problems and the identification of ways participants make sense of the phenomenon under investigation (Cooper & Schindler, 2008; Patton, 2002; Yin, 2009). This method focuses on the description of a scenario with words, feelings, and sensations (Williams, 2007), leading to a better understanding of people's motivations, actions, and beliefs in a given situation (Myers, 2013). Researchers argued that qualitative research is best suited to address descriptive, interpretive, and explanatory problems (Bluhm et al., 2011), particularly in areas with limited available research (Alshamaila et al., 2013; Kwon et al., 2014). The use of the qualitative method for this research allowed for an in-depth, richer understanding and interpretation of BT in accounting. As an emerging technology, many of the features, benefits, and challenges of BT, particularly for accounting purposes, are not well understood and thus are insufficiently explored. The qualitative method allowed for the investigation of organisations' perceptions about blockchain adoption in accounting as well as the development of a consensus on the subject being studied. Blockchain is currently on a path of diffusion across industries where leaders are looking at how to leverage and adopt the technology in different sectors (including accounting) and facing challenges related to adoption (Deloitte, 2020a). Therefore, to obtain more information about the adoption of this technology in accounting, it is important to hear from the potential users. The qualitative method allowed for an in-depth exploration of blockchain accounting adoption based on industry experts' opinions, attitudes, and actions.

4.2 Data Collection

4.2.1 Instruments: Semi-structured Interview Approach

Qualitative methodologists use many kinds of interviews, including structured, semi-structured, and unstructured interviews, each with various questioning techniques applicable for different circumstances (Creswell, 2013). In structured interviews, questions are defined in advance, and interviews are conducted with a detailed pre-planned schedule by strictly following the questionnaire (Collis & Hussey, 2009). In contrast, unstructured interviews tend to be more informal and follow a free-flowing open-ended discussion to explore the research topic instead of following a predefined questionnaire (Collis & Hussey, 2009; Fontana & Frey, 2000). Semi-structured interviews lie between structured interviews (that restrict participants from exploring their views openly) and unstructured interviews (that often tend to deviate from the research objective) (Cooper & Schindler, 2008; Horton et al., 2004; Patton, 2002).

This study used in-depth semi-structured interviews to solicit insights into the research problem. In-depth semi-structured interviews supplemented by open-ended questions provided flexibility in the data collection process as it allowed the researcher to discuss predetermined themes related to blockchain accounting and explore unknown themes through additional probing during the interview (Aberbach & Rockman, 2002; Flick, 2018; Kvale, 2007). The constructed part of the semi-structured interviews helped generate more comparable responses while retaining a degree of flexibility to expose important issues (Maxfield & Babbie, 2014). Similarly, the interviewees were free to express their thoughts and explain what they believe is relevant for the research phenomenon, which often revealed new and hidden issues related to the research topic (Kvale, 2007; Qu & Dumay, 2011). For this research, the

method has provided a basis for a profound understanding of blockchain accounting through direct interaction with the participants and enabled the researcher to clarify blockchain accounting-related concepts and statements to the participants. Moreover, open-ended responses allowed the researcher additional probing to explore new themes and comments related to blockchain accounting (Frankfort-Nachmias & Nachmias, 1996; Rubin & Rubin, 2011).

4.2.2 Participants and Sampling Process

This study adopted the purposeful sampling technique to identify participants in the qualitative phase. According to Creswell (2013), purposeful sampling ensures that the selected samples have a deep understanding of the research subject and the phenomena being investigated. Since the purpose of this study is to gain a comprehensive understanding of the adoption of BT in accounting, it was logical to select participants purposively based on the criteria of having knowledge or experience in the blockchain space, understanding the issue under study, and who are willing to share their knowledge and experience. To overcome challenges related to identifying and accessing the target population, the researcher took advantage of participants' networks. At the end of each interview, participants were asked if they knew someone with experience or knowledge in the blockchain area and were interested in participating in interviews. If so, they were requested to refer the researcher to other potential participants. However, not all referrals were pursued as the participants were carefully chosen to ensure the inclusion of information-rich cases (Patton, 2002).

The interviewees of this study included accountants, experts from Big Four accounting firms, IT professionals, blockchain experts, senior managers, and chief executive officers (CEOs) having blockchain knowledge or experience. A total of 14 interviews were conducted, representing a diverse background in terms of seniority,

expertise, and nationality. A broad spectrum of perspectives from different participants also contributed to improving the robustness of the findings.

Demographic information was collected from each participant during the interview and double-checked with their profiles on the organisation's website and the professional networking website LinkedIn[2]. All interviewees were broadly categorised into two groups: accounting background (six) and non-accounting background (eight) based on their educational qualifications. All have at least three years of work experience and represented a range of ages. Interviewees have one to seven years of practical or/and academic experience in the blockchain space, and almost all of them are involved in decision making roles. There are nine male and five female participants from different organisational settings, including information technology and services, law firms, consultancy firms, professional accounting bodies, the public sector, and Big Four accounting firms. Table 4.1 *Participant's Profiles* summarises the demographic profile of the interviewees.

[2] https://www.linkedin.com

Table 4.1 *Participant's Profiles*

ID	Specialisation	Background	Years of Work Experience	Years of Blockchain-related Experience		Decision-making responsibilities	Gender	Organisation
				Practical	Academic			
IV1	IT professional	NAcc	25-30	6	5	Yes	Male	Software
IV2	Manager	Acc	25-30	1	3	Yes	Male	Professional Accounting Body
IV3	Tax advisor	Acc	5-10	5	-	Yes	Female	Law firm
IV4	Chief executive officer	NAcc	15-20	6	-	Yes	Female	Information Technology & Services
IV5	Director	Acc	30-35	4	2	Yes	Male	Public Sector
IV6	Chief operating officer	NAcc	25-30	4	-	Yes	Female	Information Technology & Services
IV7	Legal advisor	NAcc	0-5	4	-	Yes	Male	Law Firm
IV8	Senior analyst	NAcc	10-15	4	-	Yes	Male	Information Technology & Services
IV9	Chief experience officer	NAcc	5-10	5	-	Yes	Female	Information Technology & Services
IV10	Blockchain strategy leader	Acc	5-10	7	-	Yes	Male	Big Four accounting Firms
IV11	Managing Director	Acc	25-30	4	1	Yes	Male	Accountant & Business Consultancy Firm
IV12	Chief risk officer	NAcc	20-25	4	-	Yes	Male	Information Technology & Services
IV13	Blockchain analyst	NAcc	0-5	1	-	No	Male	Information Technology & Services
IV14	Technical advisor	Acc	0-5	2.	2	Yes	Female	Professional Accounting Body

Acc- Participant with accounting background

NAcc- Participant with non-accounting background

4.2.3 Sample Size and Theoretical Saturation

The objective of the qualitative sampling strategy is exploration and clarification rather than the generalisation of information (Creswell & Creswell, 2018). As qualitative research focuses on the depth of knowledge rather than the breadth, there is no straightforward rule regarding the appropriate sample size (Patton, 2002). As Patton (2002, p. 245) argued: "The validity, meaningfulness and insights generated from qualitative inquiry have more to do with the information richness of the cases selected and the observational or analytical capabilities of the researcher rather than with sample size."

However, the common approach to determine the adequate sample size for the qualitative study research is to look out for the "saturation point" (Saunders et al., 2019; Strauss & Corbin, 1998). Data saturation occurs when no new information is expected from adding more cases to the sample (Flick, 2018; Patton, 2002; Saunders et al., 2018). The critical issue in claiming theoretical saturation is ensuring access to rich data with a thick description that ensures a wide range of opinions and diverse representations of the subject being explored (Guest et al., 2006). A recent finding by Guest et al. (2020) suggested that the majority of themes are captured through 6-7 interviews, and at the higher end of the range, 11-12 interviews are typically needed to reach a higher degree of saturation. However, they also acknowledged that selecting and interpreting rigour, precision, and confidence levels are subjective, determined by the judgment and experience of researchers. For this research, a total of 14 interviews were conducted with experts from different backgrounds. After nine interviews, theoretical saturation was achieved as no new information or patterns emerged in subsequent interviews. To determine the saturation point, the researcher analysed interview data during the interview process and searched for the emerging themes or

patterns. If any new information emerged, that was categorised, and the researcher moved to the subsequent interview. The process was continued until no new information or themes emerged and insights from interviewees became repetitive. At the end of nine interviews, participants were describing similar elements which influence decision to implement BT in accounting. This research conducted another five interviews to ensure the inclusion of all segments and to obtain a comprehensive overview of the findings.

4.2.4 Data Collection Procedure

The interview data collection involved three steps, namely developing the interview protocol; searching, identifying, and sending the invitation to potential participants; and scheduling and conducting the interview (Figure 4.1).

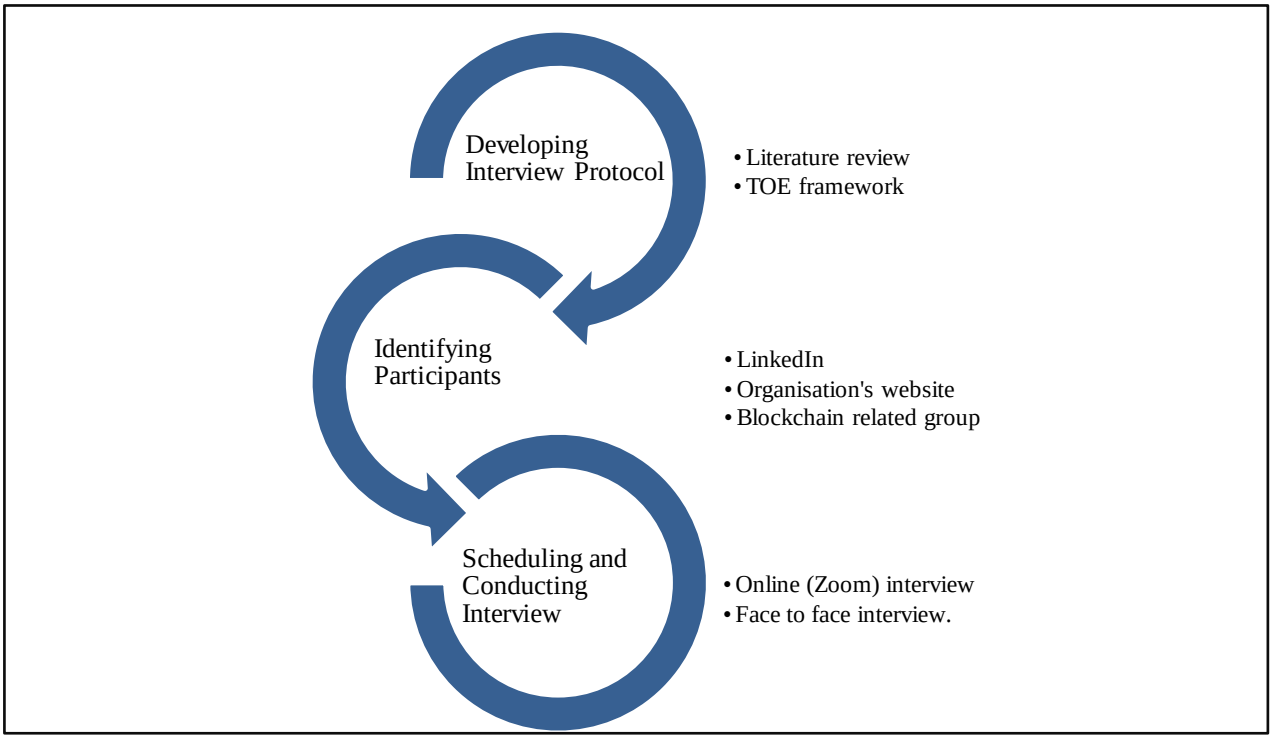

Figure 4.1. Interview Data Collection Process

Step 1: Developing Interview Protocol

The data collection procedure started with the development of an interview protocol as a guide to structuring the interview process, which aims to ensure adequate reporting within the terms of reference of the study and reduce bias through the pre-specification of non-directive questions and probes (Brenner et al., 1985; Lillis, 1999). The interview protocol for this study was designed to be used flexibly and potentially even used in a different order to extract a full and undirected response from the participants (Lillis, 1999; Qu & Dumay, 2011). The protocol outlined a set of interview questions developed based on the relevant literature related to blockchain, accounting, information systems, and the TOE framework of innovation adoption. A copy of the interview protocol used in this research is provided in Appendix B. The interview questions were open-ended and followed by probing questions. The questions were divided into four main sections. The first section focused on participant's demographic information, and the second section concentrated on interviewees' understanding of BT and blockchain accounting. The third section highlighted blockchain accounting adoption and associated factors influencing the adoption decision. The final section concentrated on possible strategies to overcome challenges related to adoption. Before conducting the final interview, interview questions were tested via trial interviews and feedback from the trial interviews was incorporated into the final interview protocol, further enhancing the validity of the content.

Step 2: Identifying and Selecting Participants

The participants for this research were purposively selected rather than randomly. The potential participants were searched for and identified through online platforms. The study utilised LinkedIn, a social networking service, as the main

platform for searching and contacting the target participants. This platform was an important step in obtaining access to interviewees and building rapport with them. Initially, a total of 40 potential participants were listed, and an invitation email was sent to each participant with a copy of the consent form and interview information sheet. Once the potential participants agreed to participate, the interview time and location were scheduled at their convenience. Due to the current COVID-19 pandemic, most of the interviews were conducted via zoom, except one that was conducted in person at the QUT campus. The researcher received each participant's signed consent form prior to the interview and sent a zoom meeting invitation link for the scheduled time.

Step 3: Conducting the Interview

During the interview, it is important to carefully and properly manage the entire process, including the timing, opening questions, probing questions, and finally, closure of the interview (Gaskell, 2000; Rao et al., 2007). For this research, all interviews were started with some warm-up or rapport-building questions followed by a brief explanation of the research objective. Thereafter, the researcher explained the details of the interview information sheet, including the voluntary participation of the interviewees, unanimous use of their responses, the process of audio-recording of the interview, and their ability to decline to answer any questions and withdraw consent at any time of the interview. Finally, participants were asked whether they had any comments or would like to share anything else (King et al., 2018). Sometimes, the issues raised by participants were added to the interview guide for subsequent interviews. All interviews were conducted following the same interview guidelines to address relevant areas of interest on a consistent basis. In total, 14 interviews were

conducted between October 2020 and February 2021, lasting between 30 to 45 minutes. They were digitally recorded and transcribed.

4.3 Data Analysis

Data analysis in qualitative research involves the process of preparing and organising data, developing codes or categories, and representing data that provides a structure or structures to answer the research questions (Creswell, 2013; Saunders et al., 2019). These steps are interconnected and represented as a data analysis spiral in which the researcher engages in moving in analytic circles rather than using a fixed linear circle (Creswell, 2013). This research followed the Creswell (2013) spiral approach for data analysis, which started with preparing and organising the interview data, followed by reading and analytical memo writing. The analytic process continued by describing, classifying, and interpreting interview transcripts to develop codes or categories. Finally, the data was presented in the format of figures, tables, or a discussion (Creswell, 2013).

4.3.1 Managing and Organising Interview Data

The data management process concentrates on organising research data into files, folders, index cards and converting files to appropriate text units (e.g., a word, a sentence, an entire story) for analysis (Creswell, 2013). Once data for this study was collected through interviews, it was transcribed by AI audio transcription software, and the transcripts were organised with an appropriate file name. The researcher further manually checked the interview transcripts. The data analysis software, NVivo 12 Plus, was used to organise, search, and analyse the data. Software like NVivo is designed to help researchers with efficient data management, reduce time-consuming repetition, and allow greater flexibility in qualitative analysis (Basit, 2003).

4.3.2 Reading and Analytical Memo Writing

After managing and organising data, the researcher scrutinised the interview transcripts to comprehend the information provided by the interviewees within the frame of the study. Analytic memos are short notes, ideas, mind maps, flow charts or coding summaries that assist in the early exploration of the database (Creswell, 2013). The researcher scanned interview transcripts several times to identify the key thoughts of the interviewees, patterns of data, coding process, and code choices. The analysis and interpretation of data started with the memo-writing process that reflects patterns, code choices, categories, and sub-categories.

4.3.3 Classifying Data into Codes and Categories

The process of describing, classifying, and analysing data develops codes or categories that match text segments regardless of the size of the database (Creswell, 2013). Codes are created to identify and analyse emerging patterns of themes (Carson et al., 2001; Patton, 2002). This study utilised Saldana (2016) first cycle and second cycle coding methods to code interview data. The cycle was used to describe the reverberative nature of coding, namely comparing data to data, data to code, code to category, category to category, category back to data, and starting with another cycle (Saldana, 2016).

First Cycle Coding

First cycle coding is the coding process at the beginning of data analysis and includes several coding methods (Saldana, 2016). According to Saldana (2016), the selection of appropriate coding methods depends on the nature and goal of the study. This research followed the initial coding of the first cycle coding methods. Initial coding, also known as ‘open coding’, aims to break down the qualitative data into discrete parts, examine them closely, and compare them for similarities and differences

(Corbin & Strauss, 2015). As an iterative process of going back and forth into the data, initial coding allowed the researcher to deeply examine the content and nuances of data and provided the researcher with analytical leads to further explore the subject being studied (Glaser, 1978; Saldana, 2016). Following a detailed line-by-line analysis of the interview transcripts, the researcher of this study identified a list of preliminary codes of factors affecting blockchain accounting adoption in the organisation.

The study also used attribute coding to document participants' demographic information such as specialisation, background, organisation, gender, and work experience. The results of the attribute coding provide essential information for analysis and interpretation. For example, it was envisaged that the thoughts, perspectives, and experiences regarding blockchain accounting and its adoption in organisations would vary among accountant and non-accountant participants. Thus, attribute coding helped to categorise and explore inter-relationship in the data set.

In the first cycle coding, 48 codes were initially identified, forming the basis for the classification, aggregation, and categorisation in the second cycle coding process.

Second Cycle Coding

Second cycle coding methods are advanced ways of reorganising and reanalysing data coded through first cycle methods to develop a sense of categorical, thematic, conceptual and/or theoretical organisation of the data corpus (Saldana, 2016). In the second cycle coding, this research followed the axial coding method to strategically reassemble data that were ‘split’ and ‘fractured’ during the initial coding process (Strauss & Corbin, 1998). At this stage, the researcher reanalysed the first cycle initial codes, identified accurate words or phrases of the initial codes, merged conceptually similar codes, and assessed infrequent codes for their utility in the overall coding schemes (Saldana, 2016). Grouping similarly coded data reduces the number

of initial codes while sorting into conceptual categories and relating categories to sub-categories.

Second cycle coding produced a list of categories and sub-categories. For instance, the benefits of blockchain in accounting mentioned by participants were included in different sub-categories, such as "efficiency", "trust and transparency", "improved reputation", and all these sub-categories were further recorded in the category "perceived benefits". Likewise, the "external pressure" category represents pressure and influences from external sources, which included two other sub-categories of "competitive pressure" and "trading partners' influence". The category "insufficient knowledge" summarised the coding of all participants' concerns about the lack of knowledge, understanding, and skill in the blockchain accounting space.

Figure 4.2 demonstrates the flow of data coding and analysis applied in the present study by providing an example of the coding mechanism of this study.

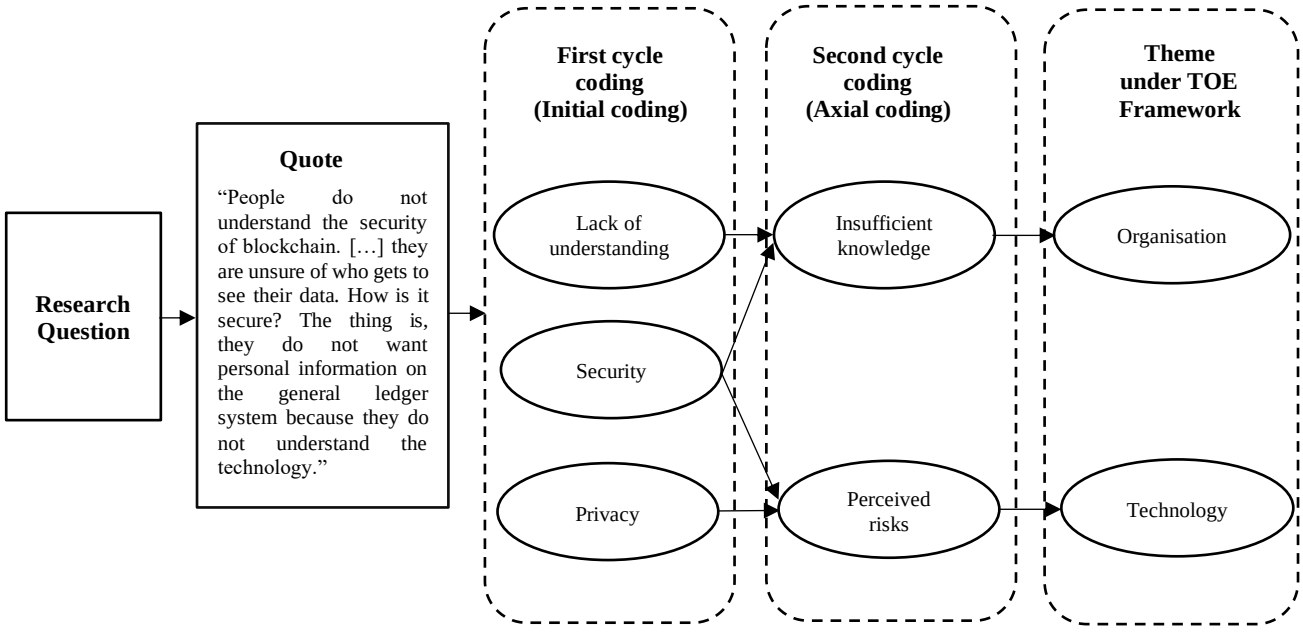

Figure 4.2. The Flow of Data Coding and Analysis

Source: Author's own elaboration

As detailed in Figure 4.2, the process started with the RQ, which was addressed through the collection of interview data. First, the researcher coded a quote of a participant using the first cycle initial coding method. In the first cycle coding, three codes were generated from the quote, labelled as “lack of understanding”, “security”, and “privacy”. In the second cycle coding, codes were further reclassified, reanalysed, and categorised. The code “lack of understanding” was labelled as “insufficient knowledge”, and “security” and “privacy” codes were categorised into “perceived risks”. The security concern was also associated with the inadequate understanding of the technology and was thus further categorised into “insufficient knowledge”. After the second cycle coding, codes were reclassified into themes. At this stage, the researcher followed the three themes of the TOE framework (technology, organisation, and environment) to categorise all codes. For example, “insufficient knowledge” was categorised as organisational context, and “perceived risks” was included under the technological dimension of the adoption factors. Finally, each theme provided an overview of factors influencing blockchain accounting adoption in the organisation. A summary of the codebook is provided in Appendix C.

4.4 Establishing Reliability and Validity

There are divergent views in assessing the quality of qualitative research, and the evaluation criteria for qualitative research differs from quantitative research. Some researchers proposed the application of some or all of the evaluation criteria of quantitative research to qualitative research (Creswell & Creswell, 2018; Flick, 2007; Maxwell, 2013), while others proposed alternative criteria for qualitative analysis such as trustworthiness, credibility, dependability (reliability), and confirmability (objectivity) (Patton, 2002; Richards & Morse, 2013; Yin, 2009). Some researchers

asserted that qualitative research should be evaluated for its dependability (reliability) and validity (Creswell & Miller, 2000; Silverman, 2013). Maxwell (2013) focused on the importance of validity in research design, whereas Guba and Lincoln (1989) emphasised credibility over validity. The present study has been evaluated using the criteria of validity and reliability. The assessment of validity and reliability is a continuous process, starting with the formulation of the research questions, research design, data collection, data analysis, and reporting of results (Graham, 2007; Ji, 2013). Reliability is related to the consistency of measurement and the reproduction and repetition of results by other researchers to draw similar conclusions (Sekaran & Bougie, 2016). Validity is seen as the correctness or credibility of description, conclusion, explanation, interpretation, or other sorts of account (Maxwell, 2013). Maxwell (2013) suggested that qualitative researchers can improve validity by identifying potential threats to validity and putting in place appropriate strategies and procedures to mitigate them. This study followed the following strategic measures to improve the reliability and validity of the research:

- This research properly documented the data collection and analysis process to ensure procedural validity. Such documentation keeps track of activities involved to generate the findings and allows other researchers to follow the steps taken during the qualitative phase and reproduce them (Creswell, 2013; Yin, 2009).
- Throughout the data collection, a well-designed interview protocol was employed to ensure the consistency of the answers across individual interviews (Patton, 2002; Yin, 2009).

- All interviews were audio-recorded with both written and verbal consent of the interviewees. The interview record enhances reliability through its ability to provide the details of the conversation (Walsham, 1995).
- The constant checking of transcriptions is suggested in previous research to ensure that any obvious mistakes have not occurred and enhance the accuracy of transcriptions (Graham, 2007). For this research, transcribing reliability was maintained by constant checking of transcripts. At first, the transcription software was used to transcribe all interviews, and then the researcher manually checked each transcription to ensure consistency between audio recording and transcriptions.
- The participants of this study were selected from diverse groups with different backgrounds, and the findings were compared with existing literature, which contributes to improving data validity (Maxwell, 2013; Yin, 2009). This approach also justifies emerging themes by converging different viewpoints (Creswell & Creswell, 2018).
- Coding-related errors could pose a validity threat. The researcher constantly reviewed and compared within and between codes and interviews to reduce coding errors. Emerging codes and content were cross-checked and verified by the supervisory team. The constant comparison of codes enhanced the validity and reliability of coding.

4.5 Ethical Consideration

This study involved the collection of human data and fulfilled the requirements of the National Statement on Ethical Conduct in Human Research. It was deemed low-risk research and approved by the Human Research Ethics Committee (UHREC) of

the Queensland University of Technology (QUT) on 28 September 2020 (approval no. 2000000743). The entire process of data collection, from searching for participants to conducting interviews, was performed by following the ethically approved agreement, attached in Appendix A.

4.6 Summary

This chapter has positioned this research within the qualitative research design and outlined the details of the methodology, including the data collection and analysis process of the study. The in-depth semi-structured interview approach was adopted to collect empirical evidence. Interview data collected from 14 participants were coded and analysed through the first cycle open coding and second cycle axial coding methods and organised into the theoretical framework. This chapter further demonstrated how the researcher achieved reliability and validity in addition to ethical considerations of this research.

Chapter 5: Findings

The purpose of this chapter is to present the research findings based on the analysis of the interview data. Section 5.1 describes the key factors found to influence blockchain adoption in accounting. These factors are then discussed within the technological (Section 5.2), organisational (Section 5.3), and environmental (Section 5.4) contexts of the TOE framework. Section 5.5 summarises the findings of the study.

5.1 Factors Influencing Blockchain Adoption in Accounting

The key focus of this study is the examination of factors influencing the organisation's decision to adopt BT in accounting. The analysis of the interview data revealed ten key factors pertaining to the adoption of BT in accounting, structured into three distinct categories (technology, organisation, and environment) of the TOE framework. Table 5.1 presents these factors, including their definition, frequency of participants, coding references, and sample quote. Each of these factors is subsequently described in detail under the technology (Section 5.2), organisation (Section 5.3), and environment (Section 5.4) contexts of the TOE framework.

Table 5.1 *Factors Influencing Organisation's Decision to Adopt Blockchain Accounting*

Dimension	Definition	Frequency of participants			Coding References	Sample Quote
		Total (Out of 14)	Acc (Out of 6)	NAcc (Out of 8)		
Technology		**14**	**6**	**8**	**151**	
Perceived benefits	The possible benefit the organisation expects to achieve by adopting a technology (Kashi et al., 2016).	13	5	8	72	"So, what this basically does is to allow for more transparency throughout the financial year and the auditors are able to perform the audit on a continuous basis, not at the end of the financial year […] very useful in the audit profession, to pick up fraud." [IV14]
Trialability	The degree to which an innovation may be experimented with on a limited basis (Rogers, 1995).	12	5	7	23	"Very few use cases in practice. The promises are just like some of the academic papers […] and some of those are business cases and not accounting linked." [IV5]
Complexity	The degree to which an innovation is perceived as relatively difficult to understand and use (Rogers, 1995).	9	4	5	20	"It is a new and complicated area of technology […] a lot of people, they grapple with how we actually make this work for our business?" [IV1]
Perceived cost	The cost of implementing necessary technologies in organisations and efforts devoted to organisational restructuring and process re-engineering (Chau & Hui, 2001).	9	4	5	24	"Any change in technology is always a big move […] to an organisational level, just because of the costs involved." [IV7]
Perceived risks	The possibility of yielding unexpected outcomes with undesirable consequences (Surbakti et al., 2020).	6	3	3	12	"If you are using public and private keys that you need to own and manage yourself, and you know that if you lose your keys, you have lost your assets." [IV4]

Dimension	Definition	Frequency of participants			Coding References	Sample Quote
		Total (Out of 14)	Acc (Out of 6)	NAcc (Out of 8)		
Organisation		**13**	**5**	**8**	**61**	
Insufficient knowledge	The lack of blockchain-related understanding, knowledge, and skills across the organisation (Balasubramanian et al., 2021).	12	5	7	35	"[…] a couple of the biggest challenges that we have as one is people do not understand the security of blockchain. […] sharing data now on a ledger system, they are unsure who gets to see my data, how is it secure!" [IV9]
Organisation's innovativeness	The extent to which an organisation is relatively earlier in adopting a new innovation compared with other organisations (Rogers, 1995).	7	3	4	17	"I think it will probably be more likely how tech-savvy that organisation is. So, if it is already using cloud-based accounting software, if it is already using digital signing solutions, I think that will be the driving factor." [IV11]
Top management support	The level of support received from higher management to adopt innovative technology for business use (Grover, 1993).	6	1	5	9	"They are the CEO, the CFO, CCO. Those are the decision-makers. […] it is not until you get to the top that things move." [IV10]
Environment		**12**	**4**	**8**	**40**	
External pressure	The degree of influences from the external business environment (Kuan & Chau, 2001).	9	2	7	32	"And if they reduce their costs because they have gone with blockchain and have changed the way they are doing business, that it will force the other companies to follow." [IV1]
COVID-19-induced transformation	The impact of the COVID -19 pandemic on blockchain adoption.	6	2	4	8	"As far as with COVID, people moving to more digital […] but one year ago, that was not the case, but COVID has changed a lot of things and has done a lot to motivate people to spend more time digitally." [IV4]

5.2 Technological Factors

Technological context refers to the internal and external technologies relevant to organisations (Tornatzky & Fleischer, 1990). In the context of this study, several features of BT and its integration with the organisation's existing accounting system have been identified as critical in the adoption decision. Analysis of the interview data revealed five key technological factors (Figure 5.1), discussed in detail in this section.

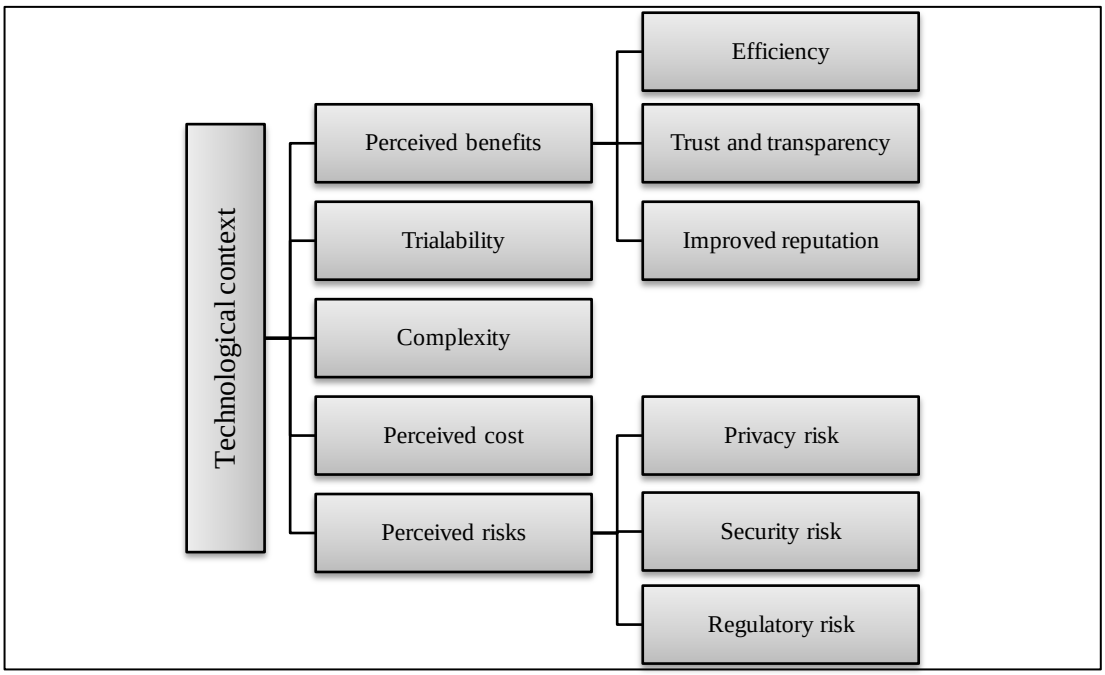

Figure 5.1. Factors in the Technological Context

5.2.1 Perceived benefits

Perceived benefits describe the possible benefit(s) organisations expect to achieve by adopting a technology (Kashi et al., 2016). As argued by Rogers (1995), it is the degree to which an innovation is perceived as being better than the idea it supersedes that directly impacts the likelihood of adoption. Technologies could bring direct and indirect benefits for organisations (Kuan & Chau, 2001). Direct benefits are mostly operational, such as increased efficiency, data security and accuracy, and trust and transparency, while indirect benefits are primarily strategic, such as improved

reputation, increased competitive advantage, and contribution to value-added activities (Kuan & Chau, 2001). In this study, almost all the participants – accounting and non-accounting background - acknowledged both direct and indirect benefits of BT in the accounting space as one of the main drivers of its adoption. The key benefits recognised by participants include increased efficiency in the accounting system, enhanced trust and transparency of accounting information, and improved reputation.

Efficiency

As a direct benefit of blockchain accounting, efficiency was frequently cited by interviewees. Blockchain efficiency in the accounting process covers several elements, including speeding up the transaction process, bringing efficiency in audit through instantaneous verification, increasing data accuracy and quality, and reducing errors and potential financial reporting fraud. Interviewees perceived that the existing accounting system often suffers from a slow transaction process and is susceptible to error and fraud. BT could speed up the accounting processes by reducing reconciliation needs of accounting data across multiple ledgers, automating the accounting and auditing processes through smart contracts, and verifying transactions almost immediately through an immutable, distributed network. Automatic reconciliation and real-time verification could help reduce time and effort involved in the transaction process and reduce human errors, improving data accuracy and quality. For example, during the COVID -19 pandemic, the Australian Government allowed the early release of super from multiple accounts, provided that the total amount did not exceed $10,000 in one financial year (ATO, 2020; Reekers & Smithson, 1994). The announcement created a huge demand for superannuation funds. In this case, an individual's request to withdraw funds from multiple accounts required reconciliation across accounts to verify the maximum ceiling and involved a longer processing time and subsequently

increased the chances of error. The use of blockchain in this context could allow nearly immediate reconciliation of withdrawal information across multiple accounts, decrease the risk of human error and effort, thereby speeding up the process of releasing funds. This was exemplified by one of our experts involved in technology-related solutions for the superannuation sector:

"There was a huge amount of demand on superannuation funds to release. For us, in a blockchain environment, we were able to reconcile and then calculate the effects of releasing that superannuation within literally a day or two, whereas we found that under the old technology, it took several weeks." [IV12]

Participants perceived increased audit efficiency through blockchain as a key driver of its adoption in the accounting space. Current auditing practices depend on the manual extraction and verification of information from different sources, requiring additional time, cost, and effort (CPA & AICPA, 2017). As blockchain records and validates transactions almost immediately and distributes the identical copy of the ledger to the participating nodes, manual data extraction and verification across ledgers will no longer be required, resulting in increased efficiency in the audit process. This was illustrated by the following quote from a blockchain expert with an accounting background:

"Blockchain will be very useful for auditors to be able to perform a continuous audit because the transactions are being put on the blockchain almost in real-time. So, the auditor will be able to pick up if there have been any illegal or fraudulent or simply incorrect transaction." [IV14]

Trust and transparency

Almost all participants agreed that the main gain with BT is the increased transparency of accounting information and trust in the network that is likely to

influence the organisational adoption decision. According to participants, the transparency and trust of information are associated with the unique features of the technology, such as the distributed-decentralised network, traceable and immutable record, and distributed data security. There was a consensus among the accountant and non-accountant participants that blockchain's promise to provide the same copy of the ledger across the network would increase transparency and reliability of the information, and traceable and immutable records could make it difficult to manipulate information as well as facilitate fraud detection. Even if any attempts are made to manipulate records, the likelihood of identifying these attempts will be enhanced. In the words of a CEO and co-founder of a software company offering blockchain solutions:

"[…] the only reason why you want blockchain is if you do not trust your customers, all the people that you have to do business with, and you want to make sure that you have that record, that something has been taken if you want to see if something has been tampered with, the blockchain is going to trace that up." [IV4]

Another legal and blockchain expert from a law firm stated that:

"The main gain with blockchain is again the trust factor. So, you do not need a third party to verify the transaction because there are multiple people with their own computing power verifying all these different transactions." [IV7]

Improved reputation

In addition to the direct operational benefits, interviewees mentioned indirect benefits of the technology, such as increased organisational reputation, that could motivate the organisation to adopt blockchain accounting. Participants noted that the technology could offer organisations opportunities for strategic development by creating a reputation of innovativeness and conveying a high-tech impression to

stakeholders. The organisations' desire to improve their technological capability to remain competitive in the market and achieve competitive advantage through a competitive information system may further propel blockchain adoption for different services, including accounting. The following quotation by an IT professional from a software company captures this factor:

"It is the desire of the company to have a differentiating factor relative to their competitors. So, part of it can be that they want to have cheaper the actual benefits of blockchain itself [...] But part of it is they want to be able to say how we are using blockchain, and so they want to sound high tech." [IV1]

While discussing the benefits of blockchain in accounting, interview participants appeared to take a pragmatic stance. Participants mentioned that all the benefits of blockchain are potential rather than actual, remaining largely unproven in the accounting context. The efficiency of the technology is not yet evident because of the lack of use cases. While there was a general acknowledgement that the benefits of blockchain accounting are the key drivers of its adoption, several interviewees attributed this to the absence of a business application:

"So, how much can I decrease my cost through the implementation of blockchain, and how much more efficiently and effectively will I operate through the blockchain? Now, these two questions have not yet been answered because we do not have any use cases." [IV14]

5.2.2 Trialability

Trialability is defined as the degree to which an innovation may be experimented with on a limited basis (Rogers, 1995). The ability to prove a concept reduces uncertainty and facilitates the adoption decision (Greenhalgh et al., 2004). As an emerging technology, blockchain accounting is still in the experimental phase. The

majority of the participants mentioned the importance of visibility of blockchain accounting performance. According to participants, the very few use cases and the unproven benefits of the technology in accounting made organisations less likely to adopt it:

"Very few use cases in practice. The promises are just it is like some of the academic papers […], so very few use cases and some of those are business cases and not accounting linked." [IV5]

Participants stated that the adoption of blockchain accounting could be prefaced by pilot projects which would help organisations to understand the performance benefits of the technology, determine cost and risks related to its adoption, and analyse whether the benefits leveraged by the blockchain-based accounting solution would be worth the cost of switching to a blockchain-oriented accounting ecosystem. Interviewees further mentioned that the trialability of blockchain for accounting purposes would uncover the changes required in the organisation before its adoption and ultimately determine whether a full adoption is feasible for the organisation or not. A supply chain and project management leader from an organisation providing blockchain-based supply chain solutions noted that:

"*It has to start with a small pilot. So, organisations working with the use case, if they see the benefit in the particular use case, then they will be more confident what they are getting out of this technology. Once they have that idea, they are more willing to adopt this technology widely. So that pilot will help and learning about this technology closely." [IV8]*

To facilitate trialability, participants indicated the need for available blockchain-led accounting solutions in the market. The release of blockchain accounting products by technology vendors could promote the usage and benefits of blockchain in

accounting. While there are blockchain products in the market for other sectors, such as the supply chain, there are very few products for accounting purposes. In the words of one of our participants:

"I would say that other sector-specific blockchain solutions, say in the construction industry or with environmental carbon reporting or track and trace the availability of the public ledger, as well as what smart contract functionality can do. […] But I see very little that is purely focused on the domain of accounting." [IV3]

5.2.3 Complexity

Complexity refers to the degree to which an innovation is perceived as relatively difficult to understand and use (Rogers, 1995). Blockchain's complexity was commonly recognised in the interviews as a barrier to its adoption, making it difficult for the decision-makers to 'get their head round'. There was consensus among the accountant and non-accountant participants that BT itself is complicated, and its integration with accounting and the existing system is also a complex process. For instance, if an organisation intends to implement BT with its current system, the system may need to interface or at least reconcile to share data efficiently, which is a time consuming and complicated process (Prewett et al., 2020). Likewise, while BT, in conjunction with smart contracts, allows for automatic recording and rapid verification of accounting information, audit of smart contracts is a complex process that requires comprehensive knowledge of the technology (Dai & Vasarhelyi, 2017). Interviewees perceived that the novelty of the technology and scarcity of knowledge adds to the complexity:

"*It is a new and complicated area of technology. And so, there are a lot of terminologies, and I think a lot of people, they grapple with how we actually make this work for our business?" [IV1]*

Moreover, complexity involves coordination in the blockchain networks as the blockchain-led accounting ecosystem requires a large number and diversity of parties working together to produce value with the technology. The integration of the technology also requires infrastructural and other related changes in the organisation, as summarised by one respondent:

"We have to work with partners to have the technology to integrate with the blockchain and integrate them with the blockchain. It means that there is a lot of work that needs to be done to set up an ecosystem […] there is a lot of integration work that has to happen." [IV12]

5.2.4 Perceived cost

Perceived cost of technology adoption indicates the cost of implementing the technology in the organisation and efforts devoted to organisational restructuring and process re-engineering (Chau & Hui, 2001). Participants of this study identified the cost of blockchain adoption and implementation as a significant barrier. A group of interviewees raised concerns about the costs involved in developing and maintaining a blockchain network. The high initial investment, learning cost to become acquainted with a blockchain-based accounting system, and enormous computational resources required by pubic blockchain influence the adoption decision. According to an expert:

"Any change in technology is always a big move; in terms of the organisational level, I do not think blockchain technology is ready to be pushed out to an organisational level just because of the costs involved." [IV8]

While the perceived cost associated with blockchain accounting implementation was identified as one of the major challenges, some participants considered these costs as a worthy investment to bring long term benefits of efficiency, particularly regarding transaction and auditing efficiency. They noted that initial implementation cost could

be offset in the long run by savings made from lower transaction time, removal of intermediaries, reduced audit fees, and reduced impact of fraud and misconduct.

"*Cost is always a consideration, but you have always got to consider two things. One is the costs of falling all the time […] what happens once you introduce the cost of the audit?" [IV11]*

However, the cost factor also depends on organisations' decision to use blockchain accounting as a service from the vendors or develop their own blockchain-based accounting system. Moreover, participants perceived that successful implementation depends on scalability: large scale adoption could make the system cost-effective over time. As mentioned by one of the participants:

"[…] at scale blockchain is cheaper […] when you find a large number of members […] blockchain as a solution is cheaper and more cost-effective for high volume." [IV12]

5.2.5 Perceived risks

Perceived risks refer to the perception of the possibility of yielding unexpected outcomes with undesirable consequences (Surbakti et al., 2020). The adoption of new technology such as blockchain is typically associated with the fear of the unknown. While the interviewees mentioned the potential benefits of the technology in accounting, they also raised concerns about the risk factors associated with the technological benefits. Some argued that the risks related to the technology make organisations sceptical about its adoption. Several risk dimensions were revealed in the interviews, including security, privacy, and regulatory risk.

Security risk

Security risk is associated with users' perception that the use of BT is not technically secure (Thakur & Srivastava, 2014). While security, as a trust component,

was commonly recognised as a driver of blockchain accounting adoption, for some interviewees, security was a significant concern for its adoption and acceptance. Participants mentioned the cybersecurity risks of the blockchain network, especially for private blockchain, where a malicious actor could easily take control of 51 percent of the network nodes. A blockchain expert and technical advisor with an accounting background stated that:

"[..] although people say that blockchain is safe and you can only hack it when you have a fifty-one percent control over the blockchain and so on. But that only applies to the public blockchain. So private blockchain can actually easily be hacked." [IV14].

The interviews further demonstrated that using public and private keys to carry out the transaction poses a security risk, as BT provides transaction security but does not provide wallet security. The CEO of an organisation offering blockchain services pointed out that:

"If you are using public and private keys that you need to own and manage yourself, and you know that if you lose your keys, you have lost your assets." [IV4]

Privacy risk

Privacy risk is related to the confidentially of information in which users' private information may be leaked to unintended sources (Thakur & Srivastava, 2014). As a distributed ledger, blockchain is designed to share data among multiple peers in the network. Participants of the interviews did raise concerns about users' willingness to share personal and sensitive information in the blockchain network. The openness of public blockchain was recognised as a disadvantage in terms of privacy and confidentiality issues. Participants suggested that this risk is likely to inhibit organisations from adopting this technology across different sectors. One participant

argued that data privacy might create governance issues and make it difficult to comply with regulations. In many countries, privacy is governed by Privacy Act rather than being a general right. The words of an accounting expert captured this risk factor:

"I think there would be resistance by companies to put information onto a distributed network that was public. There may even be legal problems with that […] there are a lot of strict rules and regulations around handling privacy in Australia." [IV2]

However, privacy issues vary according to the type of blockchain and the nature of the information. Data are more accessible and visible in public permissionless blockchain, whereas private permissioned blockchain can provide organisations with the necessary level of confidentiality by controlling access to the ledger to only authorised parties (Coyne & McMickle, 2017). This is, however, a trade-off between security and secrecy, as the control of data by a group of participants in the private permissioned network could increase the chances of security risk, as previously indicated.

Regulatory risk

The findings showed that there is a lack of specific regulations and regulatory clarity underlying BT. There were also arguments on the application of blockchain within the existing regulatory framework in terms of the privacy of the network participants. The risk associated with insufficient guidelines and framework on how to incorporate accounting standards for a secure blockchain data stream and who is accountable for users' data was recognised as a barrier for organisational adoption of blockchain accounting.

"You need to take into consideration that regulators have not yet released blockchain standards or guidelines on how to treat transactions or how to audit

transactions on a blockchain […] and that can be very scary, nonregulated technology where you do not have any influence over or control over. I think that is one of the key challenges." [IV14]

5.3 Organisational Factors

Organisational context refers to the characteristics and resources of organisations that may facilitate or inhibit the adoption of new technology. In terms of the blockchain accounting context, this study identified three factors of an organisation important for the adoption decision: knowledge and awareness of the technology, an organisation's innovativeness, and support from the top management (Figure 5.2).

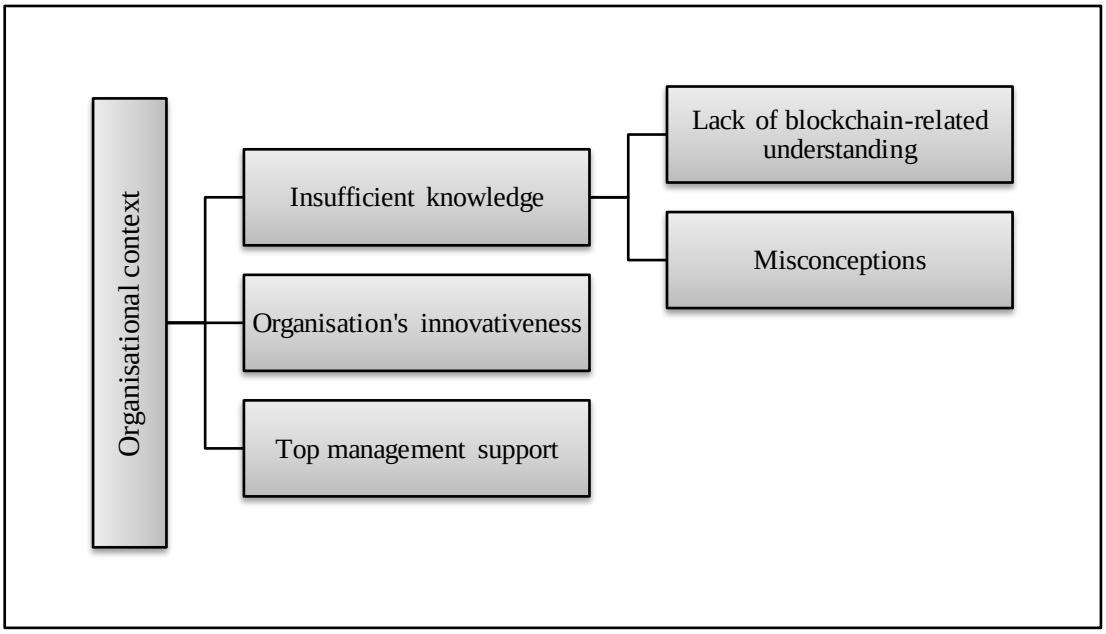

Figure 5.2. Factors in the Organisational Context

5.3.1 Insufficient knowledge

The interviewees of this research were markedly in agreement regarding the inadequate knowledge, understanding, and skills in the blockchain accounting space. The findings conceptualised that this issue is related not only to the lack of knowledge

about blockchain applications but also to the misconceptions surrounding blockchain and cryptocurrency.

Lack of blockchain-related understanding

Lack of understanding of BT was frequently cited as a barrier to its adoption. Participants acknowledged that while employees are aware of the technology, they do not grasp its application in business and accounting contexts. Because of insufficient knowledge, businesses are not able to understand what problems could be solved by blockchain and the value it could bring to the accounting domain. Organisations also struggle to conceptualise the security of the technology, illustrated by the chief operating officer of a company providing blockchain solutions for the supply chain:

"I think a couple of the biggest challenges that we have as one is people do not understand the security of blockchain. Because you are sharing data now on a ledger system, they are unsure who gets to see my data. How is it secure! The thing is, they do not want personal information on the general ledger system because they do not understand the technology." [IV 6]

Some of the interviewees also noted that for adoption, it is important for top management to understand the benefits and values of the technology so that they can diagnose the organisation's accounting need for BT and take initiatives to implement knowledge development across the organisation.

"It is basically educating the board at the organisational level. That is the first thing to understand the technology because if you do not understand the technology, you cannot see where the innovation can be or where the efficiencies, the blockchain efficiencies, can be provided within the organisation." [IV7]

In the context of accounting, participants raised concerns about the difference and uniqueness of the blockchain-based accounting system compared to the traditional accounting system and pointed to the required education and training of accountants and auditors, who are going to play a key role in implementing blockchain in accounting. According to participants, accountants and auditors need a solid understanding of how to record and audit transactions in the blockchain space, who will control and be accountable for users' data, and how reliable and secure accounting information is in the blockchain space. As mentioned by one of the participants:

"*The traditional accounting people do need to learn a little more about blockchain […] because it works very differently." [IV10]*

Misconceptions

There is a lot of misconception and confusion surrounding blockchain and cryptocurrencies such as Bitcoin. People often perceive that these two are the same thing and use these terms interchangeably. While blockchain is a decentralised distributed ledger technology that stores records of transactions across a peer-to-peer network, Bitcoin is a digital asset used as a medium of exchange and one of the applications of BT (PwC, 2016). The interviews revealed that BT is too often linked to the turmoil of Bitcoin. The negative image of Bitcoin surrounding fraud, speculation, and hacking is also reflected in BT and negatively impacts its adoption. Therefore, it is essential to understand that blockchain is not Bitcoin; Bitcoin is simply one application of BT. The clarification of this misrepresentation through education is important for adoption initiatives in all sectors, including accounting, as mentioned by respondents:

"*[…] so as of now, people see blockchain technology means Bitcoin, so that is the wrong understanding. But blockchain technology is different from Bitcoin when*

the people can separate those things, they can get a full clarity, and by seeing use case, that will be very helpful for them to understand this technology." [IV 08]

"This is still quite low penetration for actual what blockchain can do. I think most people think blockchain is Bitcoin, and so there is a long way to go with the education." [IV1]

5.3.2 Organisation's innovativeness

Innovativeness refers to the degree to which an organisation is relatively earlier in adopting a new innovation compared with other organisations (Rogers, 1995). The study's findings showed that the organisation's values, practices, and attitude of employees influence the acceptance and adoption of new technology, such as blockchain, in the existing business process. An innovative culture is expected to mobilise the technological change within the organisation and help realise blockchain's full potential. According to participants, organisations that are open to accepting new ideas, value technology, and want to develop a competitive information system would be more likely to initiate technological change. For example, organisations that are already using cloud accounting are increasingly able and willing to adopt the process of transformation into blockchain accounting. A director and founder of an accounting consulting firm stated that:

"[...] it will probably be more likely how tech-savvy that organisation is. So, if it is tech-savvy and it is already using cloud-based accounting software, if it is already using digital signing solutions, I think that will be the driving factor." [IV11]

A culture of innovativeness is also positively viewed to impact employees' willingness and openness to change. Commonly, employees are likely to resist technological change, in this case to BT, as they are concerned about the impact of technology on their regular working process.

"A lot of people that have been there really careful with not sharing any of their data. They still have to share their data in the paper form anyway. So now suddenly you are saying, let us have a shared database. So that is the challenge […], actually behavioural change and people's acceptance of this technology." [IV1]

5.3.3 Top management support

Having support from the top management helps overcome internal barriers and resistance to change related to adoption (Gutierrez et al., 2015). It was recognised through the interviews that top management innovativeness, strong support, and efforts would facilitate blockchain adoption across organisations. For example, one of the participants from a Big Four accounting firm noted that the suggestion for using this technology might come from the IT staff or accountants, but it would not move to the adoption stage until supported by top management:

"They are the CEO, the CFO, CCO. Those are the decision-makers. Of course, they will listen to the heads of their innovation groups. But it is not until you get to the top that things move. And I found this very recently […] yes, that is exactly how it works. It's people at the top." [IV10]

Another respondent raised concerns regarding the conservativeness and reluctance of top management towards technological change and emphasised the importance of their attitude and acceptance towards BT for moving into the adoption decision:

"They were speaking in a language that was very intimidating, and so business leaders and people who are very smart did not want to start thinking about the technology […] there was a pushback by saying, now we looked at it, we do not think it is for us now." [IV4]

5.4 Environmental Factors

Environmental dimension represents aspects outside the organisation in which a firm conducts its business, namely its competitors, industry, customers, trading partners, government, and regulatory environment (Tornatzky & Fleischer, 1990). In this study, the interview data produced two major environmental factors as drivers of blockchain accounting adoption: external pressure and COVID-19-induced transformation (Figure 5.3).

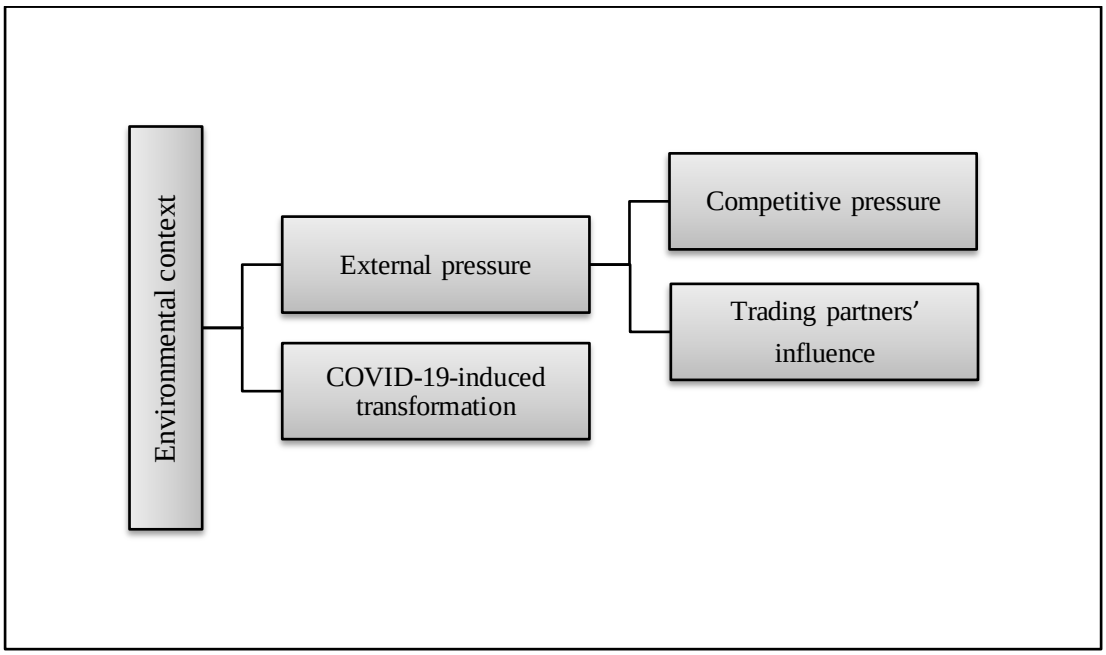

Figure 5.3. Factors in the Environmental Context

5.4.1 External pressure

External pressure indicates the degree of influence from the external business environment (Kuan & Chau, 2001). The interview findings revealed that the blockchain accounting adoption decision could be derived from the extent of influence exerted by external parties. Two types of external pressure were conceptualised through interviews: competitive pressure and trading partners' influence.

Competitive pressure

Competitive pressure describes the level of IT capability within the firm's industry and of its competitors (Iacovou et al., 1995). The greater the adoption of blockchain accounting by competitors in the industry, the higher the pressure on other firms in the industry to adopt this technology. As mentioned by participants, the adoption and usage of blockchain accounting may derive from the position of competition and the competitive information system, with the objective to gain and sustain a competitive advantage. The pressure from the competitive market and the fear of missing out from the competition will likely force organisations to explore blockchain accounting, illustrated by the following quote of a participant:

"As far as changing how you do things you need to have, some companies will do it. And if they reduce their costs because they have gone with blockchain and have changed the way they are doing business, that will force the other companies to follow." [IV1]

Trading partners' influence

The trading partners' influence refers to the extent of influence faced by the organisation from their business partner(s) (Oliveira & Martins, 2010). Trading partners can be business partners, customers, suppliers, and software vendors (Cordery et al., 2011). The findings showed that pressure from upstream and downstream business partners could push organisations to use blockchain for their accounting systems. For example, when an organisation announces its intention to transact and maintain records through BT, it tends to compel other business partners related to that organisation, such as suppliers and distributors, to use the same network for trading and maintaining cooperation. A blockchain strategy leader from one of the Big Four accounting firms explained:

"[…] suppose you are Wal-Mart, and you sort of sit at the top of the ecosystem, and people buy all sorts of stuff from you all around the world […] you are going to use a blockchain solution where to track everything with this blockchain solution. If I am part of Wal-Mart network, I am going to use it […], so suddenly, everyone has to be on it […] that is a way that they could experience pressure." [IV10].

The participants further mentioned that customers' demand for transparent, trustworthy, and faster information systems tend to pressure businesses to embrace blockchain for their accounting information systems.

"Customers are now holding corporations accountable, and if they need to be accountable, their accounting systems of who does what and when have to be transparent and have to be trustworthy. I think the influence is going to come from customers. As is the customer, I think at the end of the day, if the customers are not satisfied with the data and the information that is available to them when they want it, they will abandon that." [IV4]

5.4.2 COVID-19-induced transformation

A new environmental factor, COVID-19-induced transformation, was identified from participants' responses. The relevance and use of technologies have been highly observed during the COVID-19 pandemic. Interestingly, participants pointed to the positive impact of the pandemic on blockchain accounting adoption. According to participants, the pandemic has highlighted the significance of reliable, immutable, and trustworthy information concerning food, health, and the organisation's financial position. For example, during the pandemic, the Australian Government announced the JobKeeper scheme for eligible employers with a turnover of less than $1billion that have lost 30% or more of their revenue compared to a comparable period in the previous year (Karp, 2020). The eligibility criteria require

organisations to provide evidence of their reduced turnover compared to the previous year. The use of BT in this regard would make the process faster and reduce the possibility of manipulation and error of information, thereby making the entire process more trustworthy. As illustrated by one of our participants:

"We had COVID, or we still have COVID. […] Government released a stimulus package. […] So now imagine you had a blockchain on which the turnover was recorded. Then the company could not have changed their turnover numbers. And so, for the Government, it would have been much easier to decide who is eligible to receive JobKeeper and who is not. And I think that is so important of blockchain to become a tool that helps us to mitigate the risk for fraud and misconduct." [IV14]

It was further cited that the pandemic compelled organisations to conduct their activities digitally and accelerated employees' engagement with technology, which indirectly increased the possibility of the organisation's shift towards a blockchain-based accounting solution. A co-founder and chief experience officer from a company offering blockchain-based financial services stated that:

"*As far as with COVID, people moving to more digital […] but one year ago, that was not the case, but COVID has changed a lot of things and has done a lot to motivate people to spend more time digitally." [IV9]*

However, some of the participants raised concerns about the financial constraints of many organisations because of the pandemic, which may limit the adoption of blockchain for accounting purposes.

5.5 Summary

The research findings revealed ten key factors and ten subfactors from 14 interviews relevant to the organisation's blockchain accounting adoption decision. The

factors were presented under three broad categories of the TOE framework, namely technology, organisation, and the environment. In the context of technology, perceived benefits and trialability were recognised as key enablers, whereas perceived risks, perceived cost, and complexity were identified as inhibitors of the adoption decision. Perceived benefits include efficiency in the accounting system, enhanced trust and transparency, and a reputation of innovativeness for the organisation. Interviewees highlighted three categories of perceived risks, namely privacy, security, and regulatory risk.

Regarding the organisational dimension, top management support and the organisation's innovativeness were perceived to facilitate blockchain adoption in accounting; conversely, insufficient knowledge was identified as a critical barrier. The lack of knowledge was related to inadequate awareness of blockchain's benefits and security, lack of skill and expertise for its application in accounting, and misconceptions surrounding blockchain and cryptocurrencies.

Finally, in the environmental context, the findings demonstrated the influence of external pressure and COVID-19-induced transformation on blockchain adoption in accounting. Trading partners' influence as a component of potential blockchain networks and pressure to achieve competitive advantage were acknowledged as sub-factors of external pressure. This chapter has provided a summary of the research findings, which will be analysed and discussed in detail in the next chapter.

Chapter 6: Analysis and Discussion

This chapter presents the analysis and discussion of the research findings in relation to existing literature and theory. Section 6.1 discusses the findings within the context of the existing literature and Section 6.2 assesses their positioning within the TOE framework. Section 6.3 provides a summary of blockchain accounting adoption in organisations and possible strategies related to adoption. Section 6.4 concludes the chapter.

6.1 Discussion in the Context of Existing Literature

A dominant paradigm in innovation adoption studies involves identifying factors that act as enablers and barriers in adopting technology in organisations (Doolin & Troshani, 2007; Fichman, 2004). The factors influencing technology adoption vary across different technological innovations (Baker, 2012; Troshani et al., 2011). BT is still an emerging technology, particularly in the accounting arena. Thus, the main objective of this study is to provide a comprehensive understanding of the organisational decision to adopt BT in accounting. In recalling the primary research question of the study (RQ: What factors influence organisations' decision to adopt blockchain technology in accounting?), interviewees openly discussed the enablers and barriers related to the technology, organisation, and environment. The results of the qualitative data analysis provide a rich account of ten key factors and support the notion that an organisation's decision to adopt blockchain in accounting is not only a technological one; it is also a business decision that requires acceptance and knowledge from different levels, an innovative organisational mindset, and a set of contextual and environmental aspects. Table 6.1 summarises the adoption factors

identified in the current study, provides a comparison with the existing blockchain adoption literature, and identifies whether these factors are enablers or barriers.

Table 6.1 *Comparison of Factors Identified within Existing Literature*

Dimensions	Factors Identified	Blockchain adoption literature in other contexts	Nature of influence
Technology	Perceived benefits (efficiency, trust and transparency, and improved reputation)	Gokalp et al. (2020); Hoxha and Sadiku (2019); Kamble et al. (2019); Kulkarni and Patil (2020); Malik et al. (2021); Orji et al. (2020); Wong, Leong, et al. (2020).	Enabler
	Trialability	***New Factor***	***Enabler***
	Complexity	Gokalp et al. (2020); Orji et al. (2020); Toufaily et al. (2021); Wong, Leong, et al. (2020).	Barrier
	Perceived cost	Hoxha and Sadiku (2019); Kulkarni and Patil (2020); Orji et al. (2020); Wong, Leong, et al. (2020).	Barrier
	Perceived risks (Privacy risk, security risk, and regulatory risk)	Balasubramanian et al. (2021); Kulkarni and Patil (2020); Orji et al. (2020); Toufaily et al. (2021).	Barrier
Organisation	Insufficient knowledge (Lack of blockchain-related understanding, misconceptions)	Clohessy and Acton (2019); Malik et al. (2021); Toufaily et al. (2021).	Barrier
	Organisation's innovativeness	Balasubramanian et al. (2021); Orji et al. (2020).	Enabler
	Top management support	Clohessy and Acton (2019); Gokalp et al. (2020); Koster and Borgman (2020); Orji et al. (2020).	Enabler
Environment	External pressure (competitive pressure, trading partners' influence)	Fosso Wamba et al. (2020); Gokalp et al. (2020); Orji et al. (2020); Wong, Leong, et al. (2020).	Enabler
	COVID-19-induced transformation	***New Factor***	***Enabler***

The comparison of the research findings with existing literature demonstrates that most of the factors identified in this study are in line with the blockchain adoption literature in other business and industry contexts, such as supply chain management, logistics, the public sector, real estate, and health sector. However, this study examines these factors from an accounting perspective and recognises their influence on blockchain adoption in the accounting environment. For instance, the present study identifies perceived benefits as one of the key drivers of blockchain accounting adoption, which is consistent with previous studies on adoption consideration (Gokalp et al., 2020; Orji et al., 2020; Wong, Leong, et al., 2020). In contrast to earlier blockchain adoption studies, all of the benefits identified in this research are particularly related to the organisation's accounting process, such as efficient financial reporting and auditing and increased trust and transparency of financial information. Likewise, insufficient knowledge was identified as an inhibitor, in line with studies conducted by Clohessy and Acton (2019); Malik et al. (2021); Toufaily et al. (2021). In the context of this study, knowledge about blockchain benefits in the accounting sphere and its application for the accounting and auditing process are highlighted. This process requires the development of knowledge among managers, accountants, and auditors through adequate training and education. This is also in line with calls for integrating blockchain into the accounting curriculum (Al-Htaybat et al., 2018; Polimeni & Burke, 2020).

Two factors have emerged during the interviews, namely trialability and COVID-19-induced transformation, that were not reported in previous blockchain adoption studies. Extant research on the adoption of other technological innovations (such as cloud computing and XBRL) noted the significance of trialability in the adoption decision, arguing that experimenting with the technology increases the

likelihood of adoption (Doolin & Troshani, 2007; Karunagaran et al., 2017). Interviewees in this study also supported this notion for the accounting context. Since the benefits of blockchain in accounting are not yet widely evident, and there is a lack of practical application, the option to try and test the technology could play a positive role in its implementation. For instance, there are still a lot of unknowns surrounding audit in the blockchain platform, such as how quickly it will be done and how it will affect the profession (Deloitte, 2017b). The importance of trialability focus on this issue to better understand the process and the skills and expertise required by accountants and auditors. It is not surprising that trialability requires available blockchain-led accounting solutions and blockchain-based knowledge and expertise. While companies such as IBM, Microsoft, Amazon, and R3 has developed purpose-built blockchain solutions for different services (Balasubramanian et al., 2021), there are limited blockchain commercial solutions specifically for accounting purposes. Therefore, the findings have implications for IT vendors in terms of the development of commercial blockchain-enabled accounting solutions.

The novel factor of COVID-19-induced transformation demonstrates the positive role of the pandemic on blockchain accounting adoption. A possible explanation is that the pandemic has exposed the importance of technology to business activities and caused organisations to transform their operations digitally. At the same time, it has revealed the need for transparent, traceable, and immediate information in different business sectors that a blockchain-based information system could provide. Many possible applications of blockchain have been proposed during the pandemic (Abd-alrazaq et al., 2020). In a report, Wolfson (2020) stated that the pandemic had driven the use cases of enterprise blockchain, particularly by organisations in the health and tourism sectors. The same impact is also anticipated in the blockchain

accounting field. However, interviewees expressed concern regarding financial pressures during the COVID-19 crisis, which may render many organisations less agile and resilient and potentially limit BT adoption.

A range of factors noted in the literature did not surface in the interviews. For example, organisation size, recognised as a significant influencer for blockchain adoption decisions by prior studies, is absent in the context of this study (Clohessy & Acton, 2019; Orji et al., 2020). A possible explanation might be that adoption of blockchain accounting is not necessarily restricted by size but may in fact, depends on organisations' needs and innovativeness or other organisational factors.

Previous research also focused on individual blockchain acceptance (Queiroz & Wamba, 2019; Wong, Tan, et al., 2020) as well as organisational adoption and deployment (Clohessy & Acton, 2019; Orji et al., 2020; Wong, Leong, et al., 2020). This study contributes to the latter research stream for accounting practices. However, as a background technology, blockchain offers a limited scope of individual choice; instead, organisational acceptance is crucial. This study considers organisational acceptance and adoption of blockchain accounting as more relevant than an individual user's acceptance and provides empirical insights of determinants of blockchain accounting adoption, while other research in the blockchain accounting domain only conceptually explains issues related to adoption (Bonson & Bednarova, 2019; Dai & Vasarhelyi, 2017; Kokina et al., 2017).

6.2 Discussion in the Context of Theory

Based on the original TOE framework (Figure 3.1), the critical drivers found to influence the organisation's decision to adopt blockchain accounting are summarised in Figure 6.1. The sign next to each factor indicates the direction of influence (positive or negative) on the adoption decision.

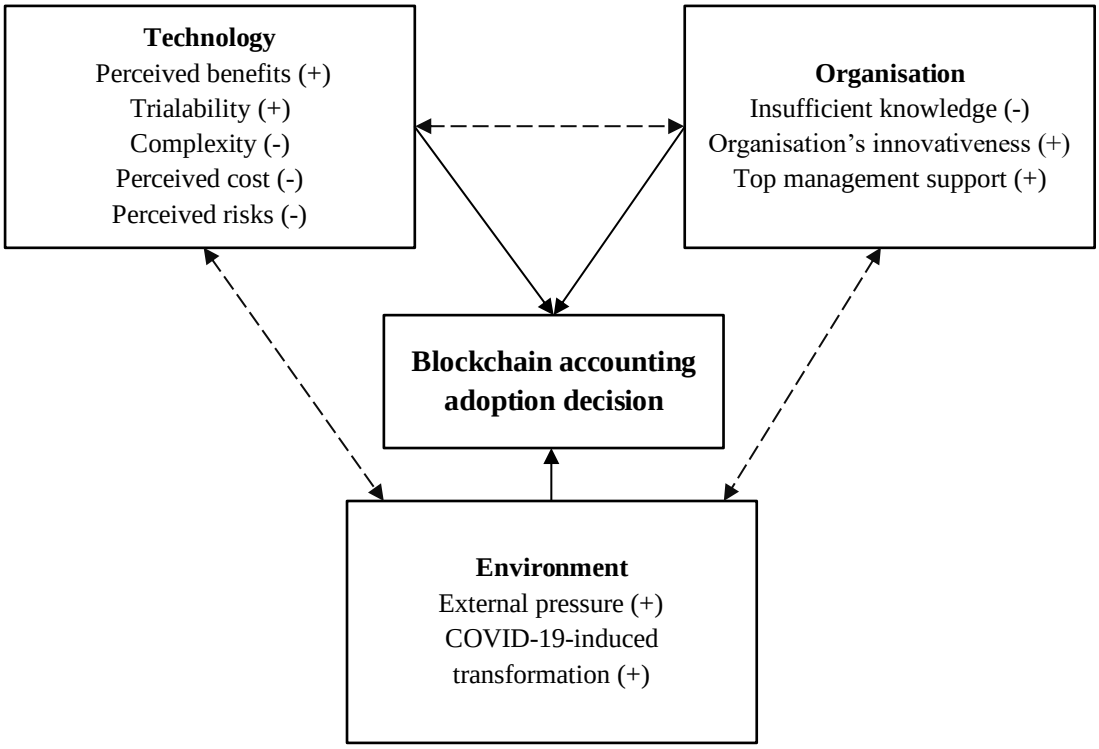

Figure 6.1. Contextual Influences on Blockchain Accounting Adoption

Interviewees stressed the importance of technological aspects compared to organisational and environmental factors. The technological dimension reveals the positive role of perceived benefits and trialability; in contrast, complexity, perceived cost, and perceived risks are observed to negatively impact the blockchain accounting adoption decision. Perceived benefits include efficiency, trust and transparency, and improved reputation. These relate to different functions of accounting, including financial accounting, auditing, and management accounting. As an example, in financial reporting, a blockchain-based accounting system allows stakeholders to generate reports and financial statements at different aggregation levels that could meet individual needs of accounting data with enhanced transparency (Dai & Vasarhelyi, 2017). Blockchain creates opportunities for efficient and more real-time auditing with immutable and traceable audit evidence (Demirkan et al., 2020). For example, traditional auditors require confirmation letters from banks to verify bank

account balances, whereas, in a blockchain environment, auditors would only have to link the dataset (Appelbaum & Nehmer, 2017). Real-time information could also make differences in management accounting, such as more accurate measurement of business performance and improved managerial decision making (Moll & Yigitbasioglu, 2019). So far, blockchain accounting research has paid significant attention to the potential benefits of the technology in the accounting domain. This research adds to the body of knowledge by empirically assessing the influence of these benefits on the organisation's adoption decision. However, there are several uncertainties and risks surrounding these benefits, making it difficult for businesses to take advantage of the technology. Given the likelihood to bring trust and transparency in the accounting processes, blockchain application to validate transactions and fraud detections requires additional consideration. Blockchain represents transactions that have happened rather than validation of the actual occurrence of those transactions. The recording of a transaction in the blockchain does not necessarily provide a guarantee that it has happened, e.g. recording an asset sold in the blockchain network does not confirm that it has been transferred from the seller to the buyer (Coyne & McMickle, 2017; Schmitz & Leoni, 2019). In some cases, blockchain capability to detect fraud might be overhyped. For example, if, from the beginning, fraudulent, illegal transactions are added to the blockchain network, the system itself may not detect or signal it (Rückeshäuser, 2017). In this regard, the role of accountants and auditors are acknowledged in exercising judgement that cannot be merely derived from blockchain accounting databases (Sheldon, 2018; Smith, 2018; Tan & Low, 2019). Apart from these uncertainties, awareness and a better understanding of benefits available through a blockchain-based accounting system are needed for its implementation in organisations.

The technological complexity and its complex integration with accounting systems discourage organisations from its adoption. The level of complexity is also attributable to insufficient understanding combined with the lack of education and training on its application in the business process. This has also been identified by Toufaily et al. (2021), who explored blockchain adoption challenges for the public and private sectors. Further, while cost was found to be an inhibitor to adoption, it is influenced by the value blockchain could bring for the organisation's accounting services. BT could be cost-effective in the long run, given that the increased cost could be offset by savings made from efficiency in the transaction and auditing process (Radanović & Likić, 2018). The degree of cost and complexity also depends on an organisation's decision to outsource or develop in-house blockchain accounting services and available blockchain-led accounting tools and platforms. Blockchain as a service for the organisation's accounting could make its adoption easy and affordable. This appears to have significant scope for the technology service providers. However, the benefits, costs, and risks associated with blockchain are not widely realised in practice, particularly in the area of accounting. There is a lack of compelling use cases to support the use of BT in accounting (Pimentel & Boulianne, 2020; Vincent et al., 2020). Trialability of the technology through pilot projects are suggested, arguing that such projects could bring evidence of the benefits, costs, and risks associated with the technology and contribute to reducing the level of uncertainty and concerns regarding its adoption in accounting.

Organisation-related issues are always important considerations for technology adoption at the organisational level, and this is also evident in the blockchain accounting context. Many organisations may be enticed to take advantage of a blockchain-enabled accounting system, but they may be unable to adopt it because of

the lack of capacities, such as lack of expertise or inadequate understanding of the technology. The findings show that insufficient knowledge is one of the significant challenges that could also impact other blockchain accounting adoption drivers. For example, support from top management could play a positive role in the adoption decision, provided that they understand the benefits of the technology for accounting purposes. According to Maduku et al. (2016), top management would be more likely to support the technology adoption if they were more knowledgeable and better informed about the technology and its benefits. Likewise, a clear understanding of blockchain implications for accounting purposes could influence employees' attitudes toward the technology and the likelihood of its acceptance. Therefore, to adopt the technology, it is important to deepen the knowledge and understanding of the benefits and risks of a blockchain-based accounting system. This appears to have potential implications for accountants and auditors to develop their understanding and skills in the blockchain space. In this regard, universities would consider including BT in their accounting curriculum.

Regarding other organisational factors, the impact of innovative organisational culture is emphasised, wherein innovative organisations are more likely to use blockchain-based accounting solutions, in line with the earlier findings of Balasubramanian et al. (2021). Moreover, the adoption of emerging technology, such as blockchain accounting, requires acceptance, cooperation, and changes across the organisation. This is more readily achieved by organisations with an innovative culture and a positive attitude towards change (Jöhnk et al., 2021).

The adoption of a blockchain-based solution also depends on external factors (Schuetz & Venkatesh, 2020). In this study, the positive impact of external pressure and the consequences of the COVID-19 pandemic were recognised. Organisations

could adopt blockchain in accounting to gain a competitive information system or to keep up with their competitors. Similarly, trading partners already using the blockchain platform could invite or indirectly influence other business partners to be a part of their blockchain network. For example, if any superstore keeps track of their purchases and transactions using blockchain, suppliers who want to trade with that superstore would be able to do if they become part of the network. Such types of influence by trading partners could lead the adoption. Moreover, the desire for up to date and transparent financial information by external parties could drive blockchain adoption in the accounting environment. For example, the existence of information asymmetry and agency problems allows organisations to provide misleading financial information to external parties (Watts & Zimmerman, 1983). Alternatively, stakeholders, such as investors and lenders, always strongly desire updated, traceable and reliable financial information in order to secure their investment (Yu et al., 2018), which are the key promises of a blockchain-enabled accounting system. However, external pressure could act as a driving force to encourage the adoption decision, given that organisations have adequate knowledge and understanding of BT in accounting. Further, the observable benefits of the technology, in this case, the benefits of blockchain in accounting, are important to develop pressure for adoption (Alshamaila et al., 2013).

The basic TOE framework illustrates the potential of interactions between technological, organisational, and environmental factors. This research also demonstrates the interrelated interactions and influences of the factors relevant to blockchain accounting adoption, as presented in Figure 6.1. For example, the perceived benefits of blockchain in accounting are a critical driver for its adoption, while the complexity, risks, high initial cost, and insufficient knowledge restrict the

benefits of the technology. Trialability, on the other hand, could bring evidence of the benefits of blockchain in accounting and justify the adoption decision. For trialability, there is a need for available blockchain-led accounting tools, knowledge, skills, and top management support. The availability of blockchain-based accounting solutions could allow potential adopters to experiment with it or experience its benefits. Similarly, the inadequate knowledge of the technology increases adoption complexity and limits the extent of support from top management, thereby inhibiting adoption. Factors related to the external environment, such as competitive pressure and COVID-19-induced transformation, act as adoption enablers by creating appeal for the benefit of blockchain usage in accounting. In a nutshell, the decision to adopt BT in accounting could be directly influenced by the set of factors derived from the analysis as well as by their interrelated interactions and influences.

6.3 Blockchain Adoption in Accounting and Possible Strategies

At present, blockchain is going through a path of diffusion across industries for various business activities (Deloitte, 2020a). For accounting, the value of blockchain is more potential than actual. The findings of this research show that in addition to blockchain potential to streamline the financial reporting and auditing process, there are many challenges related to its adoption at the organisational level. Organisations need to identify the real need of BT for their accounting services and how it adds value to the accounting system that the existing system does not. Blockchain could form a complete or partial solution for organisations' accounting treatment. The context, feasibility, and viability to adopt the technology are important considerations. For example, Microsoft and EY announced the use of blockchain-based solutions for gaming rights and royalty management to help its Xbox gaming partners and network of content creators (EY, 2020a). The gaming industry serves over 2.7 billion

consumers worldwide through the Xbox gaming platform and a network of publishers, developers, authors, designers, production houses, and distributors. The existing system of processing and distributing royalties was cumbersome, requiring 45 days to validate financial information about royalties earned and plagued by large numbers of reviews and tedious manual processes (EY, 2020a). The implementation of blockchain in this context allows the transparent processing of royalties, shares information in near real-time, reduces manual effort and processing time from 45 days to 4 minutes, and vastly improves forecasting and reporting capabilities (EY, 2020a). Therefore, blockchain accounting adoption is expected to derive from organisational needs and perceived benefits. Further, it is necessary to carefully assess the risks, costs, and associated challenges involved with the adoption and deployment of BT in accounting.

Organisations could formulate strategies to overcome challenges before moving to the adoption stage. As the findings revealed inadequate blockchain knowledge as one of the key barriers, it is important to develop knowledge, understanding, and skill in the blockchain accounting space, which is also highlighted by many prior studies (Balasubramanian et al., 2021; Clohessy & Acton, 2019; Toufaily et al., 2021). Training, seminars, workshops, networking, and blockchain-focused research and education could help build knowledge and skills in the blockchain accounting field. Currently, universities and accounting bodies are undertaking blockchain-related learning and research initiatives, which are expected to reshape the knowledge gap in this field. For example, accounting bodies (e.g., CPA Australia) suggested including blockchain-related content in its accreditation guidelines of accounting degrees (CPA Australia, 2015). Some universities (e.g., RMIT)[3] are also offering blockchain-focused

[3] https://online.rmit.edu.au/business-finance/blockchain

programs and courses to equip students with blockchain-oriented business knowledge and skills. Organisations must figure out the type of skills they need, and they may either train their existing employees or hire experts based on their needs. The required skills and expertise also depend on organisations' make-or-buy decisions, either using blockchain accounting as a service or developing their own blockchain platform. In this regard, IT service providers could play a critical role by bringing available commercial blockchain-led accounting products into the market and promoting how their products could add value for accounting purposes and how they could be utilised for different organisational structures. Technology giants IBM, Amazon, and Microsoft, have recently released their BT-as-a-service (Joshi, 2017). IBM recently announced the launch of "IBM Blockchain Platform 2.5" to enable organisations a near real-time, trusted, tamper-proof data exchange through multi-party systems (Carelli, 2020). The available blockchain accounting products could make blockchain accounting deployment more agile. Therefore, through the development of knowledge, skills, and available blockchain-led accounting solutions, organisations could start with a pilot to ramp up to full-scale adoption, assuming that organisations have a strong need for BT for their accounting services.

6.4 Summary

The analysis of the factors influencing blockchain accounting adoption at the organisational level reveals the impact of three contexts, namely technology, organisation, and environment, on the overall adoption decision. More emphasis has been provided on technology and the benefits it could bring for accounting services. Given the likelihood of increased efficiency, trust, and transparency in the accounting system, the application of blockchain to validate transactions and detect fraud requires further attention. Insufficient knowledge of the technology and its application in the

accounting area indicate the need to develop blockchain-oriented knowledge and expertise. Additionally, starting with a blockchain accounting pilot could provide evidence of the benefits, risks, and costs associated with the technology. Such trialability could create demand for available blockchain-led accounting solutions in the market. However, blockchain is not the solution for everything. Its adoption in accounting is expected to derive from the organisation's need and strong expected benefits. At the same time, education and knowledge building could reduce many of the uncertainties and barriers related to blockchain accounting adoption at the organisational level.

Chapter 7: Conclusions

This chapter aims to provide an overall summary of the research and its contribution to theory and practice. Section 7.1 provides an overview of this research by revisiting the research objective and question and summarising the theoretical positioning and methodology of the study. Section 7.2 highlights the key findings of the research, followed by a discussion of the contributions to both theory and practice in Section 7.3. Section 7.4 outlines the limitations of this research and Section 7.5 explores possible avenues for future research. Section 7.6 concludes the chapter.

7.1 Overview of the Research

This study aimed to gain a comprehensive understanding of the organisational adoption of BT in accounting by exploring factors that could facilitate or inhibit the adoption decision. The following RQ guided the research objective:

RQ: What factors influence organisations' decision to adopt blockchain technology in accounting?

BT has received growing interest in recent years in light of advances for various business applications. The potential of blockchain in accounting and auditing services are also well articulated by different groups, including researchers, accounting firms, and regulators. The extant literature on blockchain accounting acknowledged the potential benefits of the technology in accounting, including data transparency, decentralised verification of accounting information, real-time reporting, and continuous auditing (Cai, 2021; Karajovic et al., 2019; Kokina et al., 2017; Moll & Yigitbasioglu, 2019). In contrast, scholars and professionals noted the limitations of the technology surrounding scalability, high computational resources, conflict between confidentiality and transparency, and limited transaction validation (Coyne &

McMickle, 2017; Dai & Vasarhelyi, 2017). However, most studies on blockchain accounting discussed the potential implications of the technology in accounting practices and the profession as a whole, with a lack of empirical evidence to support the discussion. The empirical examination of blockchain accounting adoption, with a particular focus on enablers and inhibitors associated with the adoption decision, is insufficiently explored in the literature. Furthermore, while a number of prior studies examined blockchain adoption in different business contexts (such as supply chain management, the public sector, and real estate), research directly linked to the accounting environment is scarce. There is a lack of theory-driven empirical research on business-related blockchain adoption for accounting purposes. This research is an exploratory attempt to address this concern in the literature and provides qualitative insights into blockchain adoption in accounting.

The TOE framework has been used as the theoretical lens for this research. This is an extensively used framework for examining technology adoption in the organisation. The framework serves as a valuable tool of analysis to explore blockchain's inherent qualities and difficulties, organisations' motivation and capability, and support and pressure derived from the external environment, thereby offering a comprehensive understanding of the factors influencing an organisation's blockchain accounting adoption.

Given the research objective, this study utilised in-depth semi-structured interviews to collect data, which allowed for in-depth exploration of the topic through open-ended questions (Aberbach & Rockman, 2002; Changthong et al., 2014; Flick, 2018). The semi-structured interview method provided a profound understanding of blockchain accounting and its adoption through direct interaction with a group of experts. A total of 14 interviews were conducted with diverse backgrounds of

participants in terms of seniority, expertise, and nationality. Using NVivo 12 software, the interview data were coded and analysed based on the first cycle and second cycle coding approaches (Saldana, 2016). The codes were continuously reviewed and compared within and between the interviews to enhance the coding validity. Finally, the identified factors were organised into three distinct themes (technology, organisation, and environment) grounded by the TOE framework.

7.2 Summary of the Findings

Given the objective to gain a comprehensive understanding of the adoption of BT in accounting, this research provides rich empirical evidence of the factors that influence an organisation's decision to adopt BT in accounting. The findings reveal ten key factors that could drive or inhibit blockchain accounting adoption, positioned within the TOE framework.

Blockchain accounting adoption in the organisation is found to be influenced by different factors within the technology, organisation, and environment contexts of the TOE framework. Beyond the individual influence, the interaction of factors can also impact the adoption decision.

In the context of technology, perceived benefits comprise one of the key drivers of blockchain accounting adoption, while complexity, perceived cost, and perceived risks are identified as barriers. Considering the risks and uncertainty of BT, its trialability for different accounting functions of organisations could facilitate adoption, provided that there are available blockchain-enabled accounting solutions and skills in the market.

In terms of organisational factors, insufficient knowledge is one of the major barriers, whereas top management support and the organisation's innovativeness could facilitate the adoption decision.

Within the environmental context, external pressure and COVID-19-induced transformation are observed as drivers of blockchain accounting adoption. External pressure could derive from the competitors and trading partners of the organisation.

This study is an early attempt to explore blockchain accounting adoption at the organisational level. The findings provide a rich account of ten factors, including two new factors (trialability and COVID-19-induced transformation) that could influence the blockchain accounting adoption decision. With the direct influence of the collective set of factors, the research also reveals the possibility of interrelated interactions and impacts of the factors. Overall, the findings demonstrate that blockchain adoption in accounting could derive from the benefits and needs of the technology for accounting purposes along with the careful assessment of associated cost and risk. Regarding adoption, one of the main concerns is the lack of knowledge and understanding of the usage and benefits of blockchain in accounting. Therefore, the need for education and training is highlighted that could also reduce other uncertainties and barriers related to the technology. The findings also support the notion that an organisation’s decision to adopt blockchain in accounting is not merely a technological one; it also requires support and knowledge from different levels of the organisation and needs to be propelled by actors of the external environment.

7.3 Contributions

This study empirically examines factors affecting blockchain adoption in accounting and provides new insights regarding the accounting and information system literature. By providing a set of factors influencing blockchain accounting

adoption, the research assists business owners and managers to understand the implementation of blockchain-enabled accounting projects. As such, the findings have implications for both theory and practice.

7.3.1 Theoretical Contributions

This research provides a deeper understanding of the critical factors that could facilitate or inhibit the adoption of blockchain in accounting. The study contributes to the existing accounting and blockchain literature by empirically conceptualising factors relating to the adoption of BT. This is one of the first studies to provide the empirical groundwork to understand blockchain adoption in accounting. Most of the prior research investigating blockchain in the accounting and auditing context focused on the impact of the technology on the accounting and auditing process by adopting a descriptive or design-oriented approach. While there have been studies on blockchain adoption in different sectors, such as supply chain management, the public sector, and real estate, none have been directly linked to the accounting environment. This research is one of the first to investigate blockchain adoption for accounting purposes and provides key insights from a group of experts and potential users. Therefore, the present research advances the literature on accounting and technology adoption and addresses the gap in the literature regarding blockchain adoption in accounting.

This study confirms the relevance and applicability of the TOE framework to the blockchain accounting sphere as the research findings suggest that the adoption decision depends not only on the technology itself but also on other factors internal and external to the organisation. The study adds new variables, including trialability and COVID-19-induced transformation, in the context of the blockchain adoption literature and provides a theoretical foundation for blockchain adoption in accounting. Moreover, the identification of enablers and barriers in the TOE context provides a

comprehensive, in-depth evaluation of technological and non-technological factors inside and outside the organisation. By revealing the impact of numerous factors spanning technology, organisation, and the external environment, the research also emphasises the need for a holistic consideration to implement blockchain in accounting. This is in line with extant research that argues that exploring different relevant aspects of technology adoption results in greater predictive power in evaluating the organisational adoption process (Nilashi et al., 2016).

Moreover, the findings of this study provide a cumulative overview of specific considerations that provides motivations as to why organisation choose to adopt or not to adopt blockchain accounting. The barriers identified could further explain the slow adoption of blockchain in accounting. The research findings move beyond the direct effects of contextual factors on technology adoption, focusing on the interactions between factors. For example, insufficient knowledge is found to be an inhibitor to the adoption decision. The factor is also likely to increase the complexity related to adoption and discourage trials of the technology. Given the complex nature of technology adoption, identifying these interactions are important to understand their effects (Doolin & Troshani, 2007). In the context of accounting, the research findings corroborate existing blockchain adoption studies as well as provide new insights about the impact of trialability and COVID-19-induced transformation on the adoption decision. The research results also reflect the perspectives of accounting and non-accounting professionals in the adoption decision. The findings further contribute to the existing literature by outlining some possible strategies for overcoming challenges related to blockchain accounting adoption.

7.3.2 Practical Contributions

Organisations, researchers, and practitioners can benefit from the findings of this study. The research findings have significant managerial implications and provide practical guidelines to organisations seeking to leverage BT for their accounting services. Since organisations have recently undergone a digital transformation due to the COVID-19 pandemic, a comprehensive understanding of emerging technologies like blockchain accounting and its adoption initiatives is needed. The study provides useful analysis for managers and business owners about the factors influencing blockchain accounting adoption decisions, including opportunities and barriers they will likely face when implementing blockchain accounting projects. The findings related to insufficient knowledge and the positive influence of top management support suggest that equipping managers and employees with the requisite knowledge and skills is crucial for blockchain accounting implementation. The study implies that to embark on blockchain accounting adoption, organisations need to assess the benefits and challenges associated with the adoption decision, the inter-relationships of these issues, as well as the various teething issues of an emerging technology, which could guide managerial actions regarding adoption. Organisations could use these ten key factors as a checklist to determine the value of blockchain accounting adoption. Moreover, an in-depth exploration of the adoption factors could assist organisations in formulating strategies to overcome challenges, leading to an increase in the possibility of a successful adoption initiative.

The findings of the low level of blockchain awareness among accountants and its potential in the accounting process could also encourage accountants, auditors, and accounting professional bodies to intensify their blockchain knowledge and

awareness. The analysis emphasises the role of professional accounting bodies and universities in advancing knowledge pertaining to blockchain and accounting.

Further, the study contributes to the understanding of regulators, standard setters, and policy makers regarding the uncertainty and risk associated with blockchain accounting adoption. For adoption initiatives, it is important to address such risks. Understanding these risks could inform regulators and policymakers how an organisation intends to use blockchain accounting and what risks and uncertainty need to be addressed. Regulators and standard setters could identify areas for new blockchain accounting regulations or provide additional financial statement disclosures in a blockchain-based accounting environment.

The study also provides valuable insights to IT providers. The findings concerning trialability and the need for available blockchain-led commercial accounting solutions suggest that IT providers could play a significant role in promoting blockchain in the accounting domain and developing blockchain-based accounting platforms and tools. BT developers could concentrate on developing a cost-effective, user-friendly interface by considering organisations' accounting needs.

Finally, this study provides a research framework by identifying determinants of blockchain accounting adoption through a well-known IT adoption theory. Therefore, it has opened up a new research avenue for scholars interested in improving the understanding of blockchain adoption in accounting or other areas and contexts. Furthermore, studying the deployment of digital innovation in accounting allows researchers to learn more about other emerging technologies and their adoption in the accounting domain.

7.4 Limitations of the Research

It is worth highlighting the limitations of this research that may provide some important and additional research avenues into the subject. First, this research investigates the factors influencing blockchain accounting adoption from the perspectives of a group of experts or potential users rather than actual blockchain users. As this research examines the pre-implementation stage of blockchain accounting, expert opinions were considered relevant for assessing the adoption decision. Further, there is a lack of blockchain use cases in the accounting domain, which makes it difficult to seek opinions from actual users. However, by employing the purposeful snowball technique and collecting data from diverse background participants, this research aimed to capture the rich experience of interview participants and obtain a balanced perspective from the interviewees.

Second, this research utilised the interview instrument to collect data that is considered appropriate for the study's purpose to provide insights into the research problem. Interview data gives rise to interviewer-induced bias and presents challenges to establish the trustworthiness of the findings. The interviewees' responses could be influenced by a range of social, cultural, political or organisational factors (Easterby-Smith et al., 2002). While it is difficult to eliminate all potential biases in qualitative research, this research tried to minimise this concern by following a well-designed interview protocol for all interviews (Silverman, 2014). Moreover, the continuous liaison and discussion of emerging findings with the supervisory team reduced the risk of subjective interpretation from a single researcher.

Finally, the sample size of this research following the semi-structured interview approach could limit the generalisability of the findings to larger populations. However, this qualitative research is not trying to be statistically generalisable; instead,

it takes an exploratory approach to obtain a comprehensive understanding of blockchain adoption in accounting by identifying factors influencing such adoption in organisations.

7.5 Avenues for Future Research

The findings and limitations of this study suggest potential directions for future research in the blockchain accounting domain. This research presents key drivers of blockchain accounting adoption at the organisational level without further assessing the relative significance of these factors. Future research could evaluate the significance of the factors identified and further validate these factors by employing quantitative techniques. Quantitative research comparing the weight and magnitude of the impact of each factor on the adoption decision within and across different sectors would be beneficial.

The theoretical positioning of this study opens up avenues for future research, particularly in the area of accounting. Applying the TOE framework in the blockchain accounting context presents an opportunity for a more thorough examination of technology adoption theories in the accounting context. While this research focuses on the pre-implementation stage of blockchain accounting, stakeholders' trust in BT for accounting and auditing services could be a promising area for future research.

The limitation of generalisability of the findings also provides an opportunity for future research. Future studies could address this limitation by using a larger sample size with more diverse backgrounds and considering the perception of other stakeholders such as venture capitalists, regulators, governments, and end-users. More interviews along multiple points in time would be interesting, allowing for a longitudinal study that assesses changes over time and examines factors across the technology adoption life cycle. Moreover, an extended version of this research could

look at the association between blockchain adoption and the organisation's accounting and auditing quality.

Finally, future research could investigate blockchain accounting adoption in different research settings, in terms of a particular industry, market or geography, that would help contextualise the findings to various legal, political, and cultural jurisdictions.

7.6 Summary

This research started with a motivation to bring empirical evidence in the context of blockchain accounting adoption, aiming to explore factors influencing the organisation’s decision to adopt BT in accounting. This study represents an exploratory attempt to examine blockchain accounting adoption at the organisational level from the perspective of experts and potential users and provides holistic insights into the factors that require consideration for blockchain adoption in accounting. Grounded by the TOE framework, the research highlights the need to understand several aspects of the technology, organisation, and environment that shape the way blockchain could be adopted in the accounting domain and its potential implications for different stakeholders in the ecosystem. The findings advance the research stream of blockchain accounting and connect it to existing research fields, paving the way for further empirical research in the blockchain accounting domain.

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Appendices

Appendix A- Approved Ethics Research Documents

PARTICIPANT INFORMATION FOR QUT RESEARCH PROJECT
– Interview –

Towards an Understanding of the Adoption of Blockchain Technology in Accounting

QUT Ethics Approval Number 2000000743

Research team

Principal Researcher:	Mohsina Akter	MPhil Student
Associate researcher (s):	Associate Professor Tyge Kummer	Principal Supervisor
	Dr Ogan Yigitbasioglu	Associate Supervisor

School of Accountancy
Queensland University of Technology (QUT)

Why is the study being conducted?

This research project is being undertaken as part of Mohsina Akter's Master of Philosophy program.

The purpose of this research is to gain a comprehensive understanding of blockchain-based accounting systems by exploring the relevant factors that influence the blockchain adoption in accounting and the possible measures to overcome associated challenges.

You are invited to participate in this research project because you are a person with knowledge and experience on blockchain technology, your familiarity with technology or accounting practices as a manager, IT expert, auditor, accountants or key decision-maker of the organisation.

What does participation involve?

Your participation will involve an audio-recorded interview by digitally enabled technology such as Skype, Zoom, or over the telephone or at QUT or at your office or other agreed location at your convenience that will take approximately 30 to 40 minutes of your time.

Questions will include:

- Your views on the potential of blockchain technology.
- Your views on the effect of blockchain technology on accounting and auditing services.
- What factors will motivate or resist the blockchain accounting adoption in general and in your organisation?

Your participation in this research project is entirely voluntary. If you do agree to participate, you can withdraw from the research project. You can withdraw anytime during the interview. If you withdraw within 3 weeks after your interview, on request any information already obtained that can be linked to you will be destroyed. Your decision to participate or not

participate will in no way impact upon your current or future relationship with QUT or the researcher.

You will be able to review a transcript of your responses after the interview.

What are the possible benefits for me if I take part?

It is expected that this research project will not benefit you directly. The outcomes of the research, however, may benefit your organisation or your profession considering the adoption of blockchain-based accounting systems. It is expected that the study will provide insights into the adoption of blockchain technology in accounting sphere by identifying factors and exploring possible measures to overcome challenges related to adoption.

You can request a summary of the outcomes of the study by checking a box on the consent form or directly contact Mohsina Akter whose contact details are provided below. The findings of the study will be available in September 2021.

What are the possible risks for me if I take part?

There are no risks beyond normal day-to-day living associated with your participation in this research project.

What about privacy and confidentiality?

All comments and responses are coded, i.e., it will be possible to re-identify you. A re-identifying code stored separately to personal information (e.g., name, address), will only be accessible to the research team, and the code plus identifying information will be destroyed 5 years after the last publication.

Any personal information that could potentially identify you will be removed or changed before files are shared with other researchers or results are made public.

Any data collected as part of this research project will be stored securely as per QUT's Management of research data policy. Data will be stored for a minimum of 5 years and can be disclosed if it is to protect you or others from harm, if specifically required by law, or if a regulatory or monitoring body such as the ethics committee requests it.

As the research project involves an audio recording:

- You will have the opportunity to verify your comments and responses prior to final inclusion.
- The recording will be retained for the minimum retention period of 5 years after the last publication.
- The recording will not be used for any other purpose.
- Only the named researchers and the external transcription service (Trint) will have access to the recording.
- It is possible to participate in the research project without being recorded. If the participant does not wish to be audio recorded, then notes will be taken.

Every effort will be made to ensure that the data you provide cannot be traced back to you in reports, publications and other forms of presentation. For example, we will only include the relevant part of a quote, we will not use any names, and details such as dates and specific circumstances will be excluded. Nevertheless, while unlikely, it is possible that if you are quoted directly, your identity may become known.

Note:

The interview recordings will be transcribed through an automated transcription service (Trint) to ensure data security. Trint is located outside of Australia and this information is provided to you to obtain your fully informed consent to transfer the interview recording to the United

States for transcription purposes. Trint uses AI technology to transcribe audio files into text and generate accurate transcripts. The data will be automatically removed from Trint's servers after 90 days. Trint's security practices are aligned with international standards (ISO 27001) and the data centers are operated by Amazon web services.

How do I give my consent to participate?

We would like to ask you to sign a written consent form (enclosed) to confirm your agreement to participate.

What if I have questions about the research project?

If you have any questions or require further information, please contact one of the listed researchers:

Mohsina Akter	mohsina.akter@hdr.qut.edu.au	
Associate Professor Tyge Kummer	t.kummer@qut.edu.au	07 3138 2558
Dr Ogan Yigitbasioglu	ogan.yigitbasioglu@qut.edu.au	07 3138 2403

What if I have a concern or complaint regarding the conduct of the research project?

QUT is committed to research integrity and the ethical conduct of research projects. If you wish to discuss the study with someone not directly involved, particularly in relation to matters concerning policies, information or complaints about the conduct of the study or your rights as a participant, you may contact the QUT Research Ethics Advisory Team on +61 7 3138 5123 or email humanethics@qut.edu.au.

Thank you for helping with this research project. Please keep this sheet for your information.

CONSENT FORM FOR QUT RESEARCH PROJECT
– Interview –

Towards an Understanding of the Adoption of Blockchain Technology in Accounting

QUT Ethics Approval Number 2000000743

Research team

Mohsina Akter	mohsina.akter@hdr.qut.edu.au	
Associate Professor Tyge Kummer	t.kummer@qut.edu.au	07 3138 2558
Dr Ogan Yigitbasioglu	ogan.yigitbasioglu@qut.edu.au	07 3138 2403

School of Accountancy
Business Faculty
Queensland University of Technology

Statement of consent

By signing below, you are indicating that you:

- Have read and understood the information document regarding this research project.
- Have had any questions answered to your satisfaction.
- Understand that if you have any additional questions, you can contact the research team.
- Understand that you are free to withdraw without comment or penalty within 3 weeks after the interview.
- Understand that if you have concerns about the ethical conduct of the research project, you can contact the Research Ethics Advisory Team on +61 7 3138 5123 or email humanethics@qut.edu.au.
- Understand that non-identifiable data from this research may be used as comparative data in future research projects.
- Have the authority to speak on behalf of your company.
- Agree to participate in the research project.

Please tick the relevant box below:

☐ I **agree** for the interview to be audio recorded.

☐ I **do not agree** for the interview to be audio recorded.

☐ I **would like to** receive the findings of the project

Name _____

Signature _____

Date _____

Please return the signed consent form to the researcher.

First sample approach email

Subject Title: Interview on Blockchain Adoption in Accounting.

Dear [Name],

I am, Mohsina Akter, pursuing Master of Philosophy at Queensland University of Technology, Australia. I am currently conducting a research project, and the purpose of the project is to gain a better understanding of the blockchain technology in accounting. The study has also been approved by the QUT Human Research Ethics Committee (approval number 2000000743).

Based on your expertise, it would be great if you could participate in an interview of about 30 to 40 minutes. We could meet in person or online via Zoom or Skype.

Please let me know if this would be possible.

Many thanks.

Kind Regards

Mohsina

……..
Mohsina Akter
Principal Researcher
Email : mohsina.akter@hdr.qut.edu.au
School of Accountancy, QUT Business School
Queensland University of Technology

Follow-up approach email

Subject Title: Interview on Blockchain Adoption in Accounting.

Dear [Name],

Thank you very much for your interest in an interview in my research project.

As I mentioned earlier, the objective of my research is to gain a better understanding of blockchain technology in accounting. Your participation will provide valuable insights into the adoption of a blockchain-based accounting system.

The further details of the interview are provided in the attached Participant Information Sheet and Consent Form. It would be great to arrange a suitable time for the interview at your convenience.

If you have any further questions, please contact me via email.

Many thanks for your consideration of this request.

Kind Regards

Mohsina

Mohsina Akter
Principal Researcher
Email: mohsina.akter@hdr.qut.edu.au
School of Accountancy, QUT Business School
Queensland University of Technology

Appendix B - Interview Protocol

Interview Questions

1. Demographic Questions
    a. Years of experience
    b. Academic/Industry Position (e.g., CEO, Partner, Lecturer, Professor)
    c. Role

Fundamentals of blockchain and blockchain accounting:

2. Could you please share your views about blockchain technology?

    ……

3. To what extent do you think your organisation or colleagues are aware of blockchain technology?

    ……

4. What is your view about accounting and auditing services and the accountants' role in the context of blockchain technology?

    ……

5. In your opinion, what are the benefits and risks of blockchain technology over existing technology for accounting services?

    ……

Adoption of blockchain accounting:

6. What are the different types of technology your organisations are using for accounting purposes?

    ……

7. How effective do you think your organisations in accepting innovation?

    ……

8. What challenges do you think organisations are confronted with the adoption of new technology?

    ……

9. Does your organisation plan to use a blockchain-based accounting system in the near future? Why?

    ……

10. What factors do you think will motivate or resist the blockchain accounting in your organisation?
    ……

Factors influencing blockchain accounting adoption within the TOE framework:

Technological Factors

11. What technological factors do you think may impact the adoption of blockchain accounting? Why?

    ……

12. To what extent do you think innovation's characteristics such as (perceived benefit, relative advantage, compatibility, complexity, computational resources, cost, data security and privacy) affect the intention to adopt blockchain accounting?

    ……

Organisational Factors

13. What organisational factors do you think may impact the adoption of blockchain accounting? Why?

    ……

14. What is the impact of factors such as (top management support, organisation size, and employees' knowledge) on the adoption of a blockchain-based accounting system?

    ……

Environmental Factors

15. What environmental factors do you think may impact the adoption of blockchain accounting? Why?

    ……

16. To what extent do you think that (regulatory pressure, government statement, industry, and competitive pressure) influence the adoption of a blockchain-based accounting system?

    ……

Measures to overcome challenges

17. What do you think about the major challenges related to blockchain accounting adoption?

    ……

18. How do you think organisations can overcome those challenges?

    ……

19. In your opinion, how to raise awareness of the use of blockchain technology in accounting?

    ……

20. What changes do you think are required in organisations to adopt a blockchain-based accounting system?

    ……

Appendix C- Summary of Codebook

Name	No. of Participants	References
1. Technological Factors	14	151
1.1 Complexity	9	20
Integration complexity	7	10
Technical complexity	5	10
1.2 Perceived benefits	13	72
Efficiency	10	27
Efficient audit	6	7
Faster transaction processing	6	13
Increased accuracy & data quality	4	7
Trust & transparency	11	39
Data security	4	6
Immutable records	6	10
Real-time verification of information	8	11
Traceability of information	8	12
Improved reputation	3	4
Unproven benefit	1	1
1.3 Perceived cost	9	24
High cost	6	14
Legal cost	1	3
Operating cost	2	4
Set up cost	5	7
Cost effective	3	10
Increased benefit	3	4
Saving cost	3	6
1.4 Perceived risks	6	12

Privacy risk	4	4
Regulatory risk	3	5
Security risk	2	3
1.5 Trialability	12	23
2. Organisational Factors	13	61
1.1 Insufficient knowledge	12	35
Benefits and use of technology	9	15
Blockchain based accounting system	4	15
Misconception	5	5
1.2 Organisations' Innovativeness	7	17
Culture of change	6	9
Culture of innovativeness	4	7
1.3 Top management support	6	9
Acceptance	2	4
Initiatives	4	5
3. Environmental Factors	12	40
3.1 COVID -19	6	8
3.2 External pressure	9	32
Competitive pressure	5	12
Trading partner pressure	7	20
Business partner	2	7
Customer	4	12