



## Blockchain Adoption in Accounting and Auditing: A Qualitative Inquiry in Sri Lanka

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### Abstract

Regardless of the benefits blockchain provides to the accounting information systems, its adoption and application is limited. This study: (1) investigated the underlying reasons for this limited adoption of blockchain in a developing country context; (2) explored the potential benefits and challenges of adopting blockchain; and (3) proposed how accounting and auditing should be facilitated to adopt blockchain technology. The study utilized a qualitative general inquiry approach by conducting 13 in-depth interviews with professionals and practitioners involved in the adoption process in organizations that had adopted blockchain technology, or are researching this technology and have plans to adopt this technology in the future. Findings revealed five reasons for the lack of blockchain adoption, contributing to Technology-Organization-Environment (TOE) framework and Institutional theory. In addition, the study identified the benefits and challenges of introducing blockchain into accounting and auditing while proposing a framework to facilitate blockchain adoption in these disciplines.

**Keywords:** Blockchain Technology, Accounting, Auditing, TOE Framework, Institutional Theory

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## **Introduction**

During the past decade, tremendous growth in blockchain-based business solutions has been seen in many developed countries. Regulatory measures and necessary digital infrastructure for the initiation of blockchain adoption have developed in banking, finance, insurance, healthcare, and supply chain (Liu et al., 2019; Wang & Kogan, 2018). Literature defines blockchain as “a decentralized ledger, which stores transaction data in blocks. The blocks are added together in chronological order to form an incorruptible chain, and this chain is shared and distributed to all participating entities” (Kamble et al., 2018, p. 2009). This internet-based peer to peer network technology uses a distributed application architecture where every record, agreement, transaction, process, and payment in the network will have a digital record and a signature that can be identified and validated (Iansiti & Lakhani, 2017), and all this information is stored and shared as decentralized ledgers which enable the maintenance of an identical copy of the ledger by all network participants (Kamble et al., 2018; Schmitz & Leoni, 2019).

A review of the literature highlights that the most discussed themes on blockchain evolve around: the unique characteristics of the blockchain (Clohessy, et al., 2019; Schmitz & Leoni, 2019; Tan & Low, 2019), factors affecting blockchain adoption in developed countries (Clohessy & Acton, 2019; Iansiti & Lakhani, 2017; Janssen et al., 2019; Kamble et al., 2018; Liu et al., 2019; Woodside et al., 2017), integration of blockchain into accounting and auditing (Dai & Vasarhelyi, 2017; Kokina et al., 2017) together with the potential benefits and changes that the industry could face (Dai & Vasarhelyi, 2017; Simoyama et al., 2017; Singh et al., 2019; Tan & Low, 2019), and how the accounting and auditing professions are affected by the blockchain technology in developed nations (Dai & Vasarhelyi, 2017; Schmitz & Leoni, 2019; Tan & Low, 2019; Wang & Kogan, 2018). It was also common to focus on the potential solutions blockchain could provide to enhance the security of electronic medical records in the healthcare sector and to establish proper legal registries to engage in economic trade in developing countries (Gabriel et al., 2018; Schmidt & Sandner, 2017). The existing knowledge related to developed contexts is not adequate to explain the blockchain adoption in developing countries due to the differences in technological, socio-economic, and political environments between developed and developing countries.

Studies focusing on the adoption of blockchain in developing countries focus mainly on the areas such as agriculture, food supply chain, asset registration, and health care management (Akinradewo et al., 2022; Dhagarra et al., 2019; Kumar et

al., 2022; Mazambani & Mutambara, 2020; Mintah et al., 2020; Nanda & Nanda, 2022). Scholarly findings from the Indian context focus on the applicability of blockchain to manage the food supply chains accurately in the developing countries to minimize food wastages, remove disparities in the distribution, and make the process more transparent (Kumar et al., 2022; Mishra & Maheshwari, 2021). In addition, studies focusing on the developing countries (e.g. from the Indian and African regions) have investigated the applicability of blockchain in maintaining transparent property registries (Mintah et al., 2020) and healthcare record management (Nanda & Nanda, 2022; Dhagarra et al., 2019).

In the global context, high emphasis is given to the financial sector because “blockchain could save financial institutions at least \$20 billion annually in settlement, regulatory, and cross-border payment costs” (Fanning & Centers, 2016, p. 56). However, the blockchain adoption rates were low in developing countries (Clohessy et al., 2019) and furthermore in developing countries, the practical application of blockchain technology in the finance and accounting sectors was observed to be less. The focus of the existing studies was on healthcare, agriculture, and supply chain industries (Akinradewo et al., 2022; Dhagarra et al., 2019; Kumar et al., 2022; Mazambani & Mutambara, 2020; Mintah et al., 2020; Nanda & Nanda, 2022). This lack was also evident in the interviews conducted with the IT and accounting professionals in Sri Lanka to explore the possible research gaps before the study. Consequently, the study focuses on the lack of blockchain adoption in accounting and auditing industries in developing countries, using evidence from Sri Lanka.

Accounting and auditing would get significantly affected by the adoption of this technology leading to potential changes such as the following: companies would maintain a tamper-resistant blockchain ledger apart from the Enterprise Resource Planning (ERP) systems and cloud accounting practices which are used for current accounting practice, the reduction of the central authority of the accountant and validation of the transactions recorded in the blockchain ledger through the nodes in the network, and the emergence of new audit techniques such as smart controls, smart analytical procedures, and continuous data auditing (Dai & Vasarhelyi, 2017; Schmitz & Leoni, 2019; Tan & Low, 2019; Wang & Kogan, 2018). However, the full projections for this sector remain underexplored (Moll & Yigitbasioglu, 2019; Schmitz & Leoni, 2019). Therefore, this study further investigates what benefits and challenges could be expected by the accounting and auditing industries in developing countries and how the accounting and auditing processes should be facilitated to incorporate blockchain.

With the limited studies identified regarding blockchain implementation in developing countries and the inability at this stage to fully project the impacts of blockchain technology on accounting and auditing, novel research is necessary to obtain a full understanding of this emerging technology and its implications for the accounting and auditing sphere in developing countries (Bonson & Bednárová, 2019; Schmitz & Leoni, 2019). Therefore, conducting such a study was useful for motivating more project implementations with this technology focused on minimizing existing process inefficiencies in both the state and private sectors and for different organizations to collaborate with trust through this technology.

Accordingly, the study attempted to answer the following research questions: (1) Why is there a lack of adoption of blockchain technology in Sri Lanka compared to developed countries? (2) How will the adoption of blockchain benefit and challenge the accounting and auditing (processes and functions) in Sri Lanka? and (3) How should accounting and auditing (processes and functions) be facilitated to adopt blockchain in the future?

A qualitative inquiry approach was selected to answer these questions, while interviews were used for data collection. Thirteen (13) interviews were conducted using a semi-structured interview guide that included separate questions about blockchain adoption and its influence on accounting and auditing. The TOE framework and Institutional theory were selected as theoretical lenses; TOE being a popular theory on adopting technology by individuals/organizations (e.g. Clohessy & Acton, 2019; Clohessy et al., 2019; Dai & Vasarhelyi, 2017) and institutional theory more specifically on the isomorphic pressures being used in explaining adopting new structures/changes to organizations (e.g. Kharuddin et al., 2015; Ugrin, 2009; Yigitbasioglu, 2015) led to the selection of them to this study.

As per the authors' understanding, this study would be one of the early studies contributing to bridge the existing knowledge gap related to the above questions. The study contributes to both theory and practice: it contributes to theory by extending the discussions on TOE framework and Institutional theory in terms of a new perspective (i.e., blockchain adoption into accounting and auditing). Such extensions were also recommended by the existing literature (Moll & Yigitbasioglu, 2019; Schmitz & Leoni, 2019). Understanding the underlying reasons for lack of adoption together with the benefits and challenges of blockchain adoption from a developing country context, will facilitate organizations in their move toward blockchain. The findings on how accounting and auditing should be equipped to face this technological change

will facilitate accounting firms, accounting regulators, and accounting curriculum developers in higher education in their future moves transfer towards blockchain.

Next, a brief review of the literature is presented, followed by the methodology of the study. Subsequently, the findings are presented and discussed. Next, the conclusion section is presented, followed by a section on implications and future research directions.

## **Literature Review and Theoretical Perspectives**

### ***Definitions and Features***

The buzzword ‘Blockchain,’ which created a huge stir in the finance industry as well as a ripple effect in the other industries, is defined as a decentralized ledger system which stores information in the form of blocks which are added together in chronological order to form an incorruptible chain to allow secure transactions without the need of any intermediary or a trusted third party (Clohessy et al., 2019; Dai & Vasarhelyi, 2017; Kamble et al., 2018). The records of these distributed public ledgers are saved in multiple locations across the network, and no user in the network can individually modify the records (Clohessy et al., 2019; Schmitz & Leoni, 2019; Tan & Low, 2019).

### ***Applications of Blockchain and its Limited Adoption***

It is possible to integrate blockchain technology with other technologies such as smart contracts, artificial intelligence, and the Internet of Things (IoT). Many business transactions of many industries could be automated with trust since blockchain technology gives error messages if there is any violation of the rules between the parties in the smart contract. If there is a violation, an internal auditor or a responsible business process owner should verify the transaction's legitimacy, which ensures trust among the collaborating parties (Dai & Vasarhelyi, 2017; Rozario & Vasarhelyi, 2018).

The ability of blockchains to maintain a proper track of records about the transaction details and the security provided by the technology has significantly benefited many industries. Some attempts of leading organizations towards this upcoming technology are FedEx using blockchain to track high-value cargo and planning to extend this functionality to their entire shipments; IBM creating a ‘Food Trust Blockchain’ including nine partners such as Nestle and Dole; the Sydney stock exchange introducing their first blockchain prototype for trading stocks; Walmart

starting to tack food safety in the supply chain using blockchain technology; and KPMG partnering with Microsoft in joint projects to advice clients in various industries to adopt blockchain to their business processes (Bonson & Bednárová, 2019; Dai & Vasarhelyi, 2017; Erol et al., 2021; Liu et al., 2019; Wang & Kogan, 2018).

A study identifying the diffusion point and adoption status of blockchain reveals that there is a growing consortium of companies dedicated to blockchain adoption, but only one out of the top fortune fifty companies includes blockchain in their annual reports (Woodside et al., 2017). At the same time, blockchain adoption rates are low in developing countries (Clohessy et al., 2019).

### ***Benefits and Challenges of Implementing Blockchain in Accounting and Auditing***

New accounting ecosystems are created by incorporating blockchain with other emerging technologies such as smart contracts and the IoT connecting many parties such as auditors, managers, and stakeholders (Dai & Vasarhelyi, 2017; Schmitz & Leoni, 2019). Since blockchain distributes the power of transaction verification and storage to a group of computers, the risk of a single point of failure is reduced, and external participants can access real-time accounting information at a low cost (Dai & Vasarhelyi, 2017; Kokina et al., 2017). Thereby, stakeholders requiring financial information now need not depend on the statements issued and verified by the auditors. Instead, they could trust with certainty the real-time data available on the blockchain and execute their accounting judgments (Singh et al., 2019). This accessibility to accurate, real-time information increases the speed of decision-making, facilitates fast and efficient involvement of shareholders, and reduces agency problems (Singh et al., 2019; Tan & Low, 2019).

Further, the auditors would be able to monitor and check the accounts in real-time instead of waiting for the annual submission of reports (Simoyama et al., 2017). Then, the focus of the auditors would move to test controls in the blockchain ledger. Therefore, smart/ autonomous audit procedures, including autonomous internal control tests, autonomous analytical procedures, investigating the accuracy of programs, continuous data auditing, and audit data analytics, will be required (Dai & Vasarhelyi, 2017; Rozario & Vasarhelyi, 2018). As blockchain maintains a track of records on the transactions and all documents are traceable and unchangeable, it increases the ability to audit the information and reduces the costs of vouching and time consumed for audit procedures (Dai & Vasarhelyi, 2017; Schmitz & Leoni, 2019; Wang & Kogan, 2018).

Literature also highlights that the auditor's role would not be obsolete by adopting a blockchain-based accounting information system. It does not guarantee that financial statements will be true and fair with the adoption of blockchain, as there still remains accounting judgements and opinions to be reviewed (Dai & Vasarhelyi, 2017; Tan & Low, 2019). Further, introducing blockchain would bring new business to auditors, such as reviewing certain transactions and verifying the existence of digital assets, and attesting to the consistency between information on a blockchain and in the physical world which appear to be challenging tasks since there are no centralized authorities within a blockchain (Liu et al., 2019).

Recent literature has emphasized the challenges for blockchain adoption in several industries, which leads to a lack of blockchain adoption (Gaur, 2020; Ghode et al., 2020; Harris & Wonglimpiyarat, 2019; Kouhizadeh et al., 2021). A study that investigates the barriers to implementing blockchain in a sustainable supply chain reveals that lack of management vision, cultural differences towards a collaborative ecosystem among supply chain partners, and hesitation of workforce act as the most influential barriers (Bag et al., 2021). Similar studies reveal that inter-organizational trust, financial burdens, information disclosure policy between supply chain partners acts as organizational challenges and data transparency, higher computational power and resources for maintaining the security of data, security challenges, a negative perception toward technology and immaturity of the technology acts as technological challenges for blockchain adoption (Ghode et al., 2020; Kouhizadeh et al., 2021).

Literature also highlights the fact that the majority of blockchain implementations are still in the preliminary stage (Iansiti & Lakhani, 2017). In underdeveloped countries, it is mainly due to weak institutions and the low level of social trust, which often relies on legal institutions. In developed countries it is due the volatility of digital currencies, security and privacy concerns of personal information stored in the decentralized networks, and possibilities of unemployment of the traditional labor force with the process automation resulting from blockchain adoption (Schmidt & Sandner, 2017; Woodside et al., 2017; Yeoh, 2017). The resistance to change, the inability of law enforcement agencies to deal with fraudulent activities, and the need for a country's economy to develop standard infrastructure such as secure decentralizaed storage and transport communication protocols are also challenges for blockchain adoption (Janssen et al., 2019).

Although the above discussion presents some benefits and challenges of adopting blockchain technology, the potential benefits and challenges have not been fully

explored yet, particularly in the accounting and auditing sectors (Moll & Yigitbasioglu, 2019) and in developing countries (Schmitz & Leoni, 2019). Therefore, this study further investigates what benefits and challenges could be expected in the accounting and auditing industries in developing countries and how the accounting and auditing processes should facilitate the incorporation of blockchain, using TOE and Institutional theory as the theoretical frameworks.

### ***TOE Framework***

Technological innovation should be considered in light of the organizational context (Tornatzky et al., 1983). Thus, organizational context has been studied in relation to the adoption of technologies. In line with this, the TOE framework has been used to study background factors that strengthen or challenge the adoption of blockchain in different industries (Clohessy & Acton, 2019; Clohessy et al., 2019; Dai & Vasarhelyi, 2017); hence it is used in this study as one of the theoretical lenses.

Tornatzky and Fleischer (1990) discussed the TOE framework, which identifies three main factors that influence the adoption of IT innovations in organizations:

1. The technological factors: areas such as perceived benefits and complexity of the technology, architecture and the extent of dissemination of the technology, relative advantage of adopting such technology, data security, data integrity, scalability, and compatibility concerns of the technology (Awa et al., 2016; Baker, 2012; Clohessy et al., 2019; Tornatzky & Fleischer, 1990).
2. The organizational factors: internal factors within an organization such as prior IT experience, innovativeness, and top management support towards adopting new technologies, organizational size, readiness to adopt new technology, the business model and the technology readiness, and organizational understanding of the technology (Awa et al., 2016; Baker, 2012; Clohessy et al., 2019; Tornatzky & Fleischer, 1990).
3. The environmental factors: factors such as the regulatory environment for the technology concerned, market and industry dynamics, government interactions, business use cases, support from external parties towards new adoptions, and stakeholder reactions (Awa et al., 2016; Baker, 2012; Clohessy et al., 2019; Tornatzky & Fleischer, 1990).

The TOE framework has been used by researchers to study the impact of the above-mentioned factors on blockchain adoption in various industries (Clohessy &



Acton, 2019; Clohessy et al., 2019; Dai & Vasarhelyi, 2017; Kouhizadeh et al., 2021). Clohessy and Acton (2019) identified organizational factors such as top management support, organizational readiness, and organizational size as significant enablers of blockchain adoption, and that top management support is reinforced by a cultural factor where new IT innovations are often given a high priority. A study by Kouhizadeh et al. (2021) concludes that the maturity of the technology, lack of expertise, and the blockchain technology itself depending on other technologies such as the IoT act as technological barriers, along with specific organizational and environmental barriers.

### ***Institutional Theory***

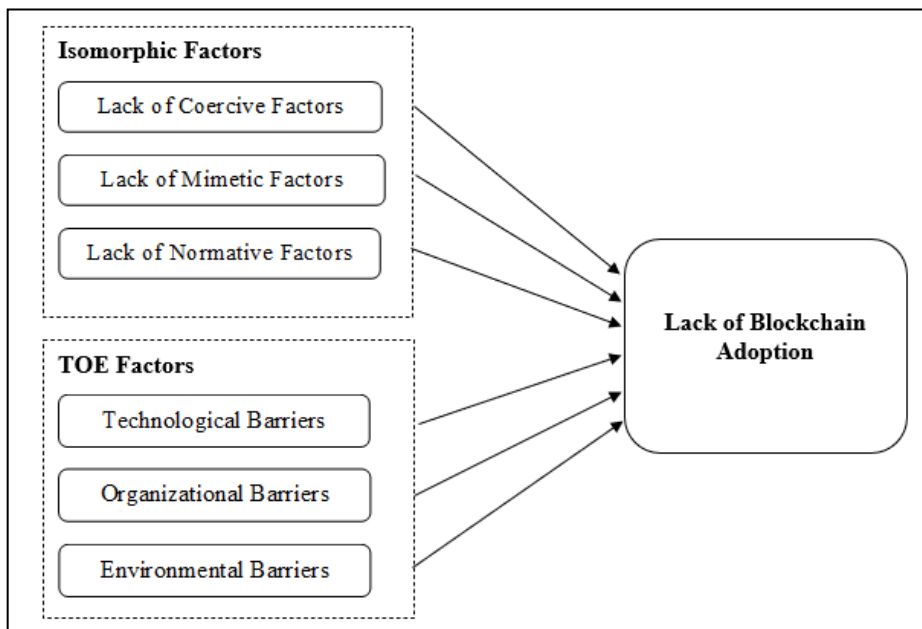
The institutional theory (especially the neo-institutional theory) is used as a lens to explore how the adoption of specific structures and practices are influenced by the isomorphic pressures/factors from their context. Accordingly, organizations tend to adopt structures due to influences from three isomorphic factors, namely, coercive factors, normative factors, and mimetic factors (DiMaggio & Powell, 1983; Gray et al., 1995). Formal processes such as regulation are referred to as coercive isomorphism; when managers/organizations follow socially constructed values created through education or profession, it is normative isomorphism; and when managers copy other entities, it is mimetic isomorphism (DiMaggio & Powell, 1983).

The literature related to isomorphic pressures and blockchain adoption emphasizes that external barriers to blockchain technology adoption can be viewed from an institutional lens (Kouhizadeh et al., 2021). Accordingly, lack of governmental regulations, lack of industry involvement in adopting blockchain technology, and lack of external stakeholder's involvement have been identified as critical barriers to adopting blockchain technology in the supply chain context, which, viewed from coercive, mimetic, and normative isomorphic lenses, could be identified as lack of isomorphic pressures to implement blockchain technology (Kouhizadeh et al., 2021). Similarly, empirical research has studied the importance of isomorphic factors at different levels for technology-related adoptions, such as mimetic pressures significantly influencing ERP adoption (Kharuddin et al., 2015; Ugrin, 2009) and isomorphic pressures influencing cloud computing (Yigitbasioglu, 2015).

In this research, the researchers decided to use the *lack of these isomorphic factors* in discussing the lack of adoption. However, the usual practice in most other studies is the opposite, where they study the *existence (not the lack) of isomorphic factors*.

In summary, the study used both the above, i.e., the TOE framework and the neo-institutional theory, as the analytical lenses to explore the adoption of blockchain in this study to strengthen the explanatory power. Accordingly, factors discussed through the TOE framework [i.e., the Technological barriers, Organizational barriers, and Environmental barriers (Clohessy & Acton, 2019; Clohessy et al., 2019; Dai & Vasarhelyi, 2017)] and the lack of existence of factors proposed in neo-institutional theory [i.e., Coercive, Mimetic, and Normative factors (DiMaggio & Powell, 1983; Ugrin, 2009)] were used in developing the theoretical framework (see Figure 1), and later as the base for analysis in answering the first research question.

**Figure 1: Theoretical Framework**



## Methodology

### *Research Design and Data Collection*

Since this study is focused on a new area of research in the Sri Lankan context, the researchers adopted a qualitative general inquiry approach which fits well with many interpretive frameworks. This approach is not bound by the rules of a methodology (and its subsequent methods) and has no allegiance to a particular philosophical viewpoint. It has four characteristics: “(a) the theoretical positioning of the researcher, (b) a congruence between methodology and methods, (c) strategies to establish rigor, and (d) the analytical lens of the researcher” (Caelli et al., 2003, p. 5).

This method is suitable when most other qualitative approaches (e.g., narrative research, phenomenology, grounded theory, ethnography, or case study) are inappropriate. In this study, suitable and relevant data/respondents were limited. No organization in Sri Lanka has adopted blockchain completely; many organizations were only using the technology underneath blockchain for one or two products/services and were mostly at the testing or initial implementation stage. Thus, a qualitative general inquiry was a suitable approach.

The study was conducted in two phases. First, at the pilot stage of the study, the researchers had a pure grounded approach and attempted to gather possible answers to the research questions. Respondents from different organizations in different industries meeting either of the following criteria were selected for interviews: (1) professionals and practitioners in organizations that had adopted blockchain technology and are involved in the adoption process; or (2) professionals and practitioners researching on this technology and have plans to adopt this technology in the future for their operations. Thirteen respondents from several organizations (see Table 1 for Interviewee details) were interviewed. The selection was made based on the intensity sampling technique (Patton, 2001) to identify the most relevant information-rich professionals and practitioners to address the research questions.

Interviews were conducted using a semi-structured interview guide with two sections (see Appendix 1). This was initially created based on the literature review related to research questions and later revised based on the pilot study data. The interviews ranged from twenty-five minutes to seventy minutes and were audio-recorded with the permission of the interviewees.

**Table 1: Interviewee Details**

<b>Respondent ID</b>	<b>Designation</b>	<b>Description</b>	<b>Interview duration (Minutes)</b>
R1	Chief Executive Officer (CEO)	Co-founder of an IT company focusing on decentralized applications, blockchain, and smart contracts solutions produced in foreign countries	70
R2	Technical Manager	Responsible for providing expert technical accounting advice and guidance; Represents the Technical Division – Institute of Chartered Accountants of Sri Lanka	40
R3	Manager-Digital Implementation	Involved in developing a blockchain-based prototype in a leading commercial bank in Sri Lanka	20

<b>Respondent ID</b>	<b>Designation</b>	<b>Description</b>	<b>Interview duration (Minutes)</b>
R4	Manager-Global Remittances	Involved in a collaboration project which used blockchain technology in a leading commercial bank in Sri Lanka.	35
R5	CEO/ Co-Founder	Co-Founder of a P2P finance company that uses blockchain technology.	30
R6	Director-Digital Technology Consulting	An Advisor/Digital Transformation Leader in one of the big four audit firms	25
R7	Senior Manager-Operations and Digital Transformation	Advisor for process re-engineering and digital transformations in one of the big four audit firms	35
R8	Senior Audit Manager	Employed in one of the big four audit firms/ Research on blockchain integration to Accounting and Auditing practices	30
R9	Audit Manager	Employed in one of the big four audit firms/ Research on blockchain integration to Accounting and Auditing practices	35
R10	Program Manager	Involved in a Blockchain Integration Project launched by an International Association of NGOs.	25
R11	Manager-IT Infrastructure Planning	Advisor for digital transformation in one of the leading telecommunication company	27
R12	Director	Member of Central Bank Blockchain Committee involved in the KYC project	25
R13	Supply Chain Manager	Research on blockchain integration to apparel exports/ Employed in a leading apparel exporting company in Sri Lanka	30

### *Data Analysis*

One researcher transcribed the thirteen audios verbatim for analysis, and the second researcher checked the transcripts to ensure completeness. The two researchers read all interview transcripts several times before coding. An analytical framework was developed based on the theoretical framework in relation to answering Research Question 1 (Why is there a lack of adoption of blockchain technology in Sri Lanka compared to developed countries?). However, an inductive approach was followed in coding data, being open to any emerging codes/themes. In

answering the other two research questions (i.e., How will the adoption of blockchain benefit and challenge the accounting and auditing (processes and functions) in Sri Lanka? and How should accounting and auditing (processes and functions) be facilitated to adopt blockchain in the future?) the analysis extracted data in relation to respondents views on (1) whether (and if so, how) the blockchain technology could be adopted by Sri Lankan organizations; (2) benefits/challenges of adopting the blockchain technology in the accounting and auditing sectors in Sri Lanka; and (3) whether (and if so, how should) the accounting and auditing processes and functions be equipped to facilitate the adoption of blockchain in the Sri Lankan context.

## Findings and Discussion

The findings are discussed next, under three main areas focusing on the three research questions.

### *Lack of Adoption of Blockchain Technology in Sri Lanka: Why?*

As evident from the data, the adoption level of blockchain technology in Sri Lanka is low, and some respondents also referred to the lack of global adoption levels. The framework used for analysis included six (06) codes developed from the two theories (technological barriers, organizational barriers, environmental barriers, lack of coercive factors, lack of mimetics factors, and lack of normative factors), and another open code as - other reasons for lack of adoption. Apart from the six factors, a new factor was evident under 'any other reasons' in the data. Thus, the main barriers stated by the respondents were: (1) technological infrastructure-related barriers; (2) organizational barriers; (3) environmental barriers; (4) lack of isomorphic factors (3 factors); and (5) lack of trust. Next, these are discussed in detail:

#### *Technological (Infrastructure) Barriers*

As identified afresh through this study, the lack of tech infrastructures such as digitized processes and payment facilities was noted as one barrier to blockchain adoption from a developing country perspective. The lack of availability of tech infrastructure, and particularly the lack of knowledge on infrastructure among the prospective stakeholders was emphasized by respondents:

*The technology is matured enough. The problem is with the infrastructure. ... When it comes to Ethereum<sup>1</sup>, it works as expected. But, to reach the general public and*

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<sup>1</sup> Ethereum is an open-source, blockchain-based, decentralized software platform that is used for its own cryptocurrency, which is called 'ether'. With this Smart Contracts and Distributed Applications can be built and run without any downtime, fraud, control, or interference from another third party (Frankenfield, 2021).

*match the user's requirements is difficult, because the processes are not user-friendly. For example, to do with smart contracts you need a wallet, digitalized processes, and ethers. But in Sri Lanka, we don't even have PayPal properly. So, people need to get to know what this is actually and get involved with digitalized processes and payment methods. – R1*

Unavailability of a national cloud is another tech-infrastructure related factor emphasized by respondents, which creates complexities and inhibits the blockchain adoption. For instance:

*We don't have a national cloud. We do have a government cloud but that's not accessible to every person. Even local companies are still using foreign clouds. We use AWS, and Google Cloud. So, our data sit in different jurisdictions. – R7*

Even though technological barriers such as the novelty of the technology, the requirement for substantial power and storage resources were discussed as barriers in prior studies (Dai & Vasarhelyi, 2017; Iansiti & Lakhani, 2017; Liu et al., 2019; Woodside et al., 2017), these two important technology-related aspects are **identified for the first time by this study**, as per the authors' knowledge.

### *Organizational Barriers*

Six main factors were identified under organizational barriers. The high initial cost and the high maintenance cost are emphasized to be the main two barriers to blockchain adoption in Sri Lanka under organizational barriers. For instance, as expressed by R11:

*From my perspective, to apply this technology, you need an investment. Organizations in Sri Lanka won't invest unless they have a huge financial advantage. For example, a company wanting to implement a blockchain will look for its financial benefit because there will be a huge investment.*

In addition, the time taken to realize financial benefits and the lack of confidence in the probability of realizing financial benefits were two other reasons stated for the lack of adoption. As R13 stated:

*...this is in a very competitive industry ... For any kind of process improvement, fast benefit realization is key. Is the project worth, cost-benefit, when will we get the financial returns and how confident are we about it, we have to think. With the huge investment we must do, we must look at returns. How much, when, for how long, are we covering the initial cost, is maintenance affordable etc. etc. ... This is common to any firm... If the probabilities for benefit realization are low, then we will not take them to the list.*

Prior literature also states the financial burden of implementing a blockchain ecosystem (Clohessy & Acton, 2019; Ghode et al., 2020) and the ongoing maintenance and monitoring costs that are incurred thereafter (Clohessy & Acton, 2019; Dai & Vasarhelyi, 2017; Ghode et al., 2020; Janssen et al., 2019; van Hoek, 2019) as significant barriers for blockchain adoption.

Apart from the above four factors, the small firm sizes resulting in a lack of innovation were stated as another factor constraining the adoption. As most Sri Lankan enterprises are falling into small and medium scale, the firm sizes are small, and the 'C' level managers<sup>2</sup> in them give less priority to innovation as they are more focused on profits and sustainability of the firms. Clohessy and Acton (2019) have also discussed small firm size as a barrier to blockchain adoption.

Lastly, a cultural reason, which is the resistance to a change, was also evident within the Sri Lankan context. As stated by many respondents, most individuals prefer stability in their jobs and organizations, and changes are not embraced; specifically, the ones arising with advanced technologies are neglected until the point at which they become essential. Clohessy et al. (2019), Liu et al. (2019), and Woodside et al. (2017) have also stated similar reasons that had inhibited blockchain adoption.

### *Environmental Barriers*

Two factors that were not mentioned in prior literature were identified within data that can be categorized under environmental barriers. Firstly, getting the relevant stakeholders to agree to get connected to a common platform is a real challenge for organizations in developing countries, as viewed by many respondents. Secondly, the ownership and control-related aspects (such as who will own and control the blockchain; what institution will sponsor and control the blockchain, etc.) were other barriers evident from the data. For instance, R10 stated,

*..... the applicability of applying it to a particular use case is not simple because you need many stakeholders to agree on it. So, connecting stakeholders and getting them into the right platform is the problem right now, and there should be somebody who will own it.*

Thus, these two factors: (1) obtaining the agreement of relevant stakeholders; and (2) ownership and control-related aspects, are ***newly identified in this study***.

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<sup>2</sup> 'C' level managers are Chief Executive Officers (CEOs), Chief Information Officers (CIOs), Chief Financial Officers (CFOs)

### *Lack of Isomorphic Pressures*

Firstly, as stated by most respondents, the accounting and auditing regulators lack technical savviness; the regulators themselves are yet to explore and learn the blockchain technology to a level at which they can introduce regulations and promote the adoption of blockchain. Thus, pressure from regulators, discussed as normative pressures under institutional theory, is lacking in the Sri Lankan context, resulting in the lack of adoption rates of blockchain. Next, due to the limited adoption, the availability of use cases is limited, and there is little awareness of the impact of adopting blockchain. Thereby, the possibility of adopting blockchain as a solution during uncertain or ambiguous situations to sort issues in accounting or auditing is less. Not only in accounting and auditing, when considering any industry, none of the firms sees their competitors or similar organizations adopting blockchain successfully, which might inspire them to adopt it when there is any issue/need for the use of blockchain. Therefore, the pressure discussed as mimetic pressure under institutional theory is also lacking in the Sri Lankan context inhibiting the adoption rates. Furthermore, there are no government mandates, laws or rules that promote the adoption of blockchain within the country nor in accounting and auditing [*“If the government introduce this technology and take the initiative the things will be moving fast.”* – R11]. This kind of pressure is discussed as coercive pressures under institutional theory. It is also lacking in the Sri Lankan context leading to a lack of blockchain adoption.

Further, the above insights indicate the need for timely responses from regulatory authorities to promote and expedite the adoption process of this new technology. R5, who is a CEO, stated that:

*In terms of adoption in Sri Lanka, I don't think that many players are aware of the implications it could have. Unless there is a push by regulatory bodies to push the use case, where you can show a network of companies like financial institutions and banks which might have trust issues with each other, they can come on a shared platform and share information; the current adoption in Sri Lanka would be at a very low rate.*

In general, prior literature discuss the influence of one or all of the isomorphic factors/pressures on the adoption of new technologies and structures (Kharuddin et al., 2015; Kouhizadeh et al., 2021; Ugrin, 2009; Yigitbasioglu, 2015). They discuss how these factors promote adoption. The novelty here is that this study examines the lack of such factors as inhibitors for adopting blockchain technology.



*Lack of Trust:*

Lack of trust was a new factor that emerged under the code – ‘any other reasons’ while analyzing data. This is not discussed in TOE framework or isomorphic pressures in the institutional theory.

Apart from the need for a push from the regulators, hidden between the lines of the statement of the CEO (R5) in the above section is the need for building trust among the users of a blockchain. The lack of trust among the stakeholders of a blockchain is another reason for the lack of adoption of blockchain within the Sri Lankan context. This was evident from some other respondents as well. E.g.:

*For a blockchain implementation, different stakeholder groups should come on board and should be on par. Also, for a blockchain to make sense, many counterparties should be willing to adopt blockchain. Therefore, blockchain implementation should be developed. It's not a plug and play model that could be done on an overnight basis. – R12*

Trust between the stakeholders is required for introducing and institutionalizing/promoting new changes within organizations/ societies, as identified by Ghode et al. (2020). A similar situation exists with Blockchain adoption in Sri Lanka; currently, the trust in the blockchain technology and the trust between the stakeholder groups is not established to a level that is favorable to the adoption. Thus, building trust in the technology and between the stakeholder groups is another aspect that needs to be addressed by regulators.

***Benefits and Challenges of Blockchain Adoption for Accounting and Auditing***

***Benefits***

Five benefits resulting from blockchain adoption were identified within the collected data. The most significant benefit of blockchain adoption for accounting ecosystems is the high levels of transparency and credibility due to its decentralized nature:

*In a double-entry system, we have debits and credits posted in a single ledger of a single company. What is not allowed for is transparency. Auditors cannot look into those transactions without having direct access to the books. And that sorts of accounts are allowed for frauds essentially because you can go back to these books, and we see numerous cases where books are essentially cooked and management gives false representation to the auditors and regulators. – R9*

Secondly, data also reveal that blockchain simplifies the routine work of accountants and auditors by eliminating manual checking and verification processes

through maintaining a proper track of records and reduced audit procedures such as vouching and obtaining external confirmations.

Thirdly, as the blockchain ledger maintains a trail of evidence, it enhances the auditability of transactions in real-time and the possibility of taking immediate corrective actions. Similar findings were reported by Dai and Vasarhelyi (2017) and Wang and Kogan (2018). They stated that adopting a blockchain-based accounting ecosystem would increase the auditability of information and reduce the effort and time of auditors in terms of checking the source documents and proper flow of communications.

The next benefit is the ability to minimize fraudulent activities. Due to the availability of real-time data with blockchain-based accounting ecosystems, the manipulation of data becomes impossible within the accounting process, and frauds are minimized to a great extent.

*If somebody wants to correct the blockchain, there should be two parties who have to agree. There can't be any eligibility for fraud. If some mistake in a transaction happens and if a party wants to remove the transaction, they have to get the consent of the other party. Therefore, the good news is every single transaction is traceable.*

– R6

The fifth benefit would be the changes resulting in auditors' roles that could lead to additional support for better decision-making and management in organizations. With the smart contract logic built in blockchains, auditors can look at transactions in real-time and focus on auditing real-time data rather than past data. This possibility, together with increased transparency and data integrity, will reduce the chances of transactions being manipulated. Thus, the roles of auditors could change into advisors. For instance, R9 stated that:

*Maybe a potential integration: Auditors whilst stay auditing real-time data, they would have advise for companies like, this is where your cash is going short, you would have a cash flow problem if this continues, do you want to look at a merger or acquisition, this is how your share price would potentially be affected. – R9*

### *Challenges*

The data reveals that, although blockchain eliminates human errors, system errors and/or cyber-attacks could result from improper implementation of technology. If one ledger is hacked, the whole ecosystem would collapse. For instance, as stated by R7:

*Back in the day, say you hack only 'Western Union' among the financial institutions, it's only that arm. The other banks will not suffer, and the government will not have a loss of data. But here, if you hack one ledger you get access to data of multiple ledgers in multiple institutions, which is a huge threat. That is why we need very strict regulations, lots of cybersecurity around it.*

These system errors become a challenge for accountants and accounting processes as they may result in a loss of the entire set of accounting records.

Secondly, the accounting and auditing professions have evolved with the rise of technology. Therefore, accountants' specific roles would change and require a new set of skills if a real-time autonomous accounting ecosystem is introduced. This could be a challenge.

*We will have a replacement of traditional bookkeeping. Currently, we rely on the bookkeeper's record-keeping, but in a blockchain, it's all automatic. So, what is the role of a bookkeeper? What's the role of the accountant? The accountants should be more focused on the analysis and interpretation of underlying data. So, the skills of the accountants need to change. – R9*

With the focus of the traditional accountant would move from bookkeeping to interpreting accounting information some job roles could become threatened:

*The job roles of data entry staff, accounts assistants and accounts clerks might be affected. Such kind of job roles might not be there when there is a blockchain adoption. – R2*

The financial burden is another challenge that was commonly mentioned by respondents apart from the above. Additional costs may have to be incurred by firms in training and monitoring. Mainly because of the system errors and system failures interruptions that may be caused to accounting systems. Also, with the high number of people trying to record a lot of information in the system, further interruptions may arise. Therefore, accountants and accounting staff will need to be trained appropriately, and additional system monitoring costs may have to be borne by the organizations.

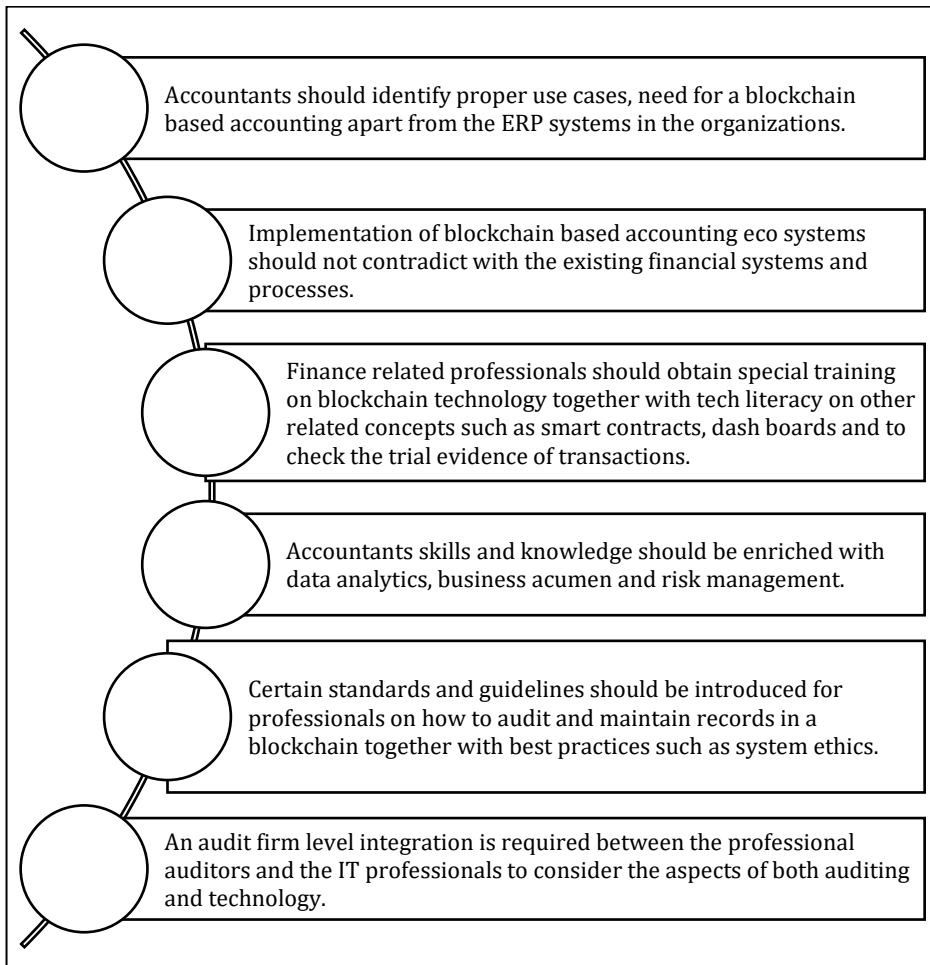
A similar challenge arises from the direction of the auditors. Many respondents stated that the auditors must ensure that the system is correct and could be relied upon. Therefore, the audit firms will also need to have specialized systems to audit blockchain-based accounting ecosystems. In addition, the audit staff will need to be

trained in these new systems. This will result in a raise in their audit fee, increasing the accounting-related cost to the business firms once again.

### ***Facilitating Accounting and Auditing for Blockchain Adoption***

A proposal summarizing how the accounting and auditing processes and functions should be facilitated to adopt blockchain is depicted in Figure 2 below:

**Figure 2: Summary of How the Accounting and Auditing Processes and Functions Should Adopt Blockchain**



For successful implementation of a blockchain-based accounting ecosystem, accountants should consider what use cases are available and how their ERP relates to the blockchain without contradicting the existing financial systems. Further, as blockchain allows a path for advanced analytics, it is possible to generate reports and

spreadsheets that include data from many companies. Therefore, apart from that overall understanding, accounting and auditing professionals also need to develop skills related to analytics and analytical tools, and an in-depth knowledge on using the features of the blockchain . For instance, R2 and R7 stated that:

*The demand for analytical knowledge will increase like Big Data analytics. Then they might need knowledge of risk management. Both IT professionals and accountants might need a thorough knowledge of smart controls implemented to manage various risks in a blockchain” - R2 “Accountants will need to be skilled in Data Analytics because blockchain is almost data. It's no longer recording data but analyzing data. – R.*

Prior literature also emphasizes the importance of obtaining special training on blockchain technology together with tech literacy on concepts such as cloud computing, big data, artificial intelligence, and database security (Rozario & Vasarhelyi, 2018; Wang & Kogan, 2018).

The data further elaborates that system ethics should be introduced for accountants and auditors against illegal activities and manipulation. Since the accounting and auditing standards are in international convergence, the standards will remain unchanged even at a blockchain adoption. However, specific provisions must be introduced under each standard to guide accounting and auditing practices in a blockchain.

The findings finally reveal that integration between auditors and IT professionals would be necessary at the audit firm level to consider the aspects of both auditing and technology when auditing a blockchain to increase the quality of audits.

## **Discussion**

The recent literature that focuses on Blockchain emphasizes technological barriers such as the novelty of the technology, the need for complex storage and computational power, and the competition and repetition of work between the existing ERP systems and the blockchain (Dai & Vasarhelyi, 2017; Iansiti & Lakhani, 2017; Liu et al., 2019; Woodside et al., 2017). Adding to the existing literature, the findings of this study emphasize the lack of tech infrastructures such as digitized processes, payment methods such as Paypal, and national cloud facilities as technological barriers in a developing country context for blockchain adoption.

Among the organizational barriers, the scholarly work significantly emphasizes the financial burden that organizations in developed countries face when

implementing blockchain-related projects (Clohessy & Acton, 2019; Ghode et al., 2020). Similarly, this study reveals the financial burden that organizations face together with the ongoing maintenance and monitoring costs as significant organizational barriers for blockchain adoption by further enhancing the validity of the findings of the past studies. Similarly, the findings on the aspects such as the existing culture in developing countries which shows a reluctance towards a change from their traditional systems, difficulties faced during the integration of the blockchain with the traditional business processes, less priority given by the current 'C' level managers in terms of innovation complies with the findings of previous researchers (Clohessy & Acton, 2019; Gaur, 2020; Ghode et al., 2020; Liu et al., 2019; Kouhizadeh et al., 2021).

The literature focusing on the environmental barriers to blockchain focuses on challenges such as agreeing with the stakeholders to join a common platform, the problems in ownership and control of the blockchain, and the lack of proper legislation required to monitor how the technology evolves, which were also evident in the study which further enhances the existing knowledge (Ghode et al., 2020; Kouhizadeh et al., 2021).

The findings reveal the lack of established regulations, laws and standards on block chain adoption. lack of motivation from the regulatory authorities to expedite the adoption process, the lack of professional forums in developing the awareness about the technology, the lack of competitor organizations or similar others in the industry with successful use cases that can be relied upon by new entrants indicate the lack of isomorphic pressures within the Sri Lankan context. These findings comply with the results of previous researchers, stating the importance of government involvement in blockchain implementations by encouraging innovations and maintaining flexible policies (Gaur, 2020; Kouhizadeh et al., 2021; Yeoh, 2017).

Scholars have both studied and predicted the benefits and challenges of blockchain adoption in the accounting and auditing sectors. Benefits such as enabling real-time, transparent accounting information which is accessible to many parties due to the distributed nature of the blockchain (Dai & Vasarhelyi, 2017; Kokina et al., 2017; Schmitz & Leoni, 2019), reducing the routine work of the accountants and auditors and eliminating the eligibility to fraud (Schmitz & Leoni, 2019; Wang & Kogan, 2018) were also identified in this study. Adding to the available literature, this study revealed that audit procedures such as vouching and other substantive audit procedures would decline, and auditors may have to rely on the controls and conduct

analytical procedures. Auditor's physical presence would not be necessary to conduct branch and foreign audits. Therefore, the audit paradigm would change where the planning and execution stages will have to be given attention when auditing a blockchain.

The security issues for a technological adoption, such as cyber-attacks due to improper implementation of technology where the entire ecosystem would be affected, resulting in million-dollar losses, were identified by respondents of the study which were also predicted in other literature (Woodside et al., 2017; Yeoh, 2017). The findings of the study also comply with the existing literature stating that the traditional role of accountants will be replaced after the introduction of automated blockchain ecosystems (Moll & Yigitbasioglu, 2019; Woodside et al., 2017; Yeoh, 2017). Enhancing the findings on challenges that exist for blockchain adoption in the accounting and auditing sectors, the study elaborates that conducting a blockchain audit will require corporates to pay a higher audit fee because the audit firms would also need specialized systems to verify the blockchain-based ecosystem is correct and could be relied upon to carry further audit procedures.

To equip accounting and auditing processes and functions to facilitate the adoption of blockchain in the future, accounting professionals should obtain special knowledge on blockchain technology together with concepts such as cloud computing, big data, artificial intelligence, advanced data analytics, knowledge of business acumen, basic algorithms and database security. This is similar to existing findings by other scholars (Moll & Yigitbasioglu, 2019; Rozario & Vasarhelyi, 2018; Wang & Kogan, 2018). In addition to the above, this study revealed fresh insights on facilitating accounting and auditing to adopt blockchain such as introducing system ethics, considering the use cases such as how the ERP relates to the blockchain without contradicting the existing financial systems and providing proper training for finance professionals on the use of system dashboards, tracking and tracing a transaction from the first end of the transaction and providing foundational awareness related to blockchain technology.

## **Conclusion**

The TOE framework and the Institutional theory were used to discuss the lack of blockchain adoption in accounting and auditing within the Sri Lankan context. As the main reasons for the lack of blockchain adoption, the study identified: (1) lack of understanding and availability of technological facilities; (2) organizational barriers; (3) environmental barriers; (4) the lack of isomorphic pressures; and (5) lack

of trust among the stakeholders. In an attempt to promote blockchain, it is necessary to think from an ecosystem point of view, and the authorities should establish proper technological infrastructures such as payment and cloud facilities in the country for a successful technological transformation. Further, environmental factors such as inter-organizational trust and sponsorship should be developed, and control issues should be settled. Promoting institutional pressures through government and professional bodies can promote adoption in terms of coercive and normative pressures. Once the positive results of use cases are available and visible, there is the opportunity and possibility for mimetic pressures to get activated among similar and competitive organizations; however, currently, this pressure is also lacking.

Next, the study demonstrated that adopting blockchain-based accounting ecosystems would enhance the transparency of the transactions, enable auditors to audit real-time data, enhance the auditability of the transactions and reduce the time and effort of the auditors in performing specific substantive audit procedures as benefits of adopting blockchain. Possible vulnerabilities with cyber-attacks and challenges faced by the traditional accountants adapting to blockchain were stated as challenges which were also apparent in the existing literature. In addition, there were some novel findings on challenges, such as the risk of system errors, interruptions that might disturb the functioning of the entire ecosystem, and an increase in audit fees of auditing a blockchain-based ecosystem.

Finally, proposals for facilitating the adoption of blockchain in accounting and auditing were presented. They include introducing system ethics for professional accountants and auditors, introducing provisions under existing accounting and auditing standards by the regulatory bodies, considering ways of connecting the current ERP systems with the blockchain ecosystems and having audit firm level integrations between IT professionals and professional auditors. These activities would facilitate the adoption of blockchain technology in accounting and auditing domains.

### ***Implications and Future Research Directions***

The study contributes to both practice and literature. It contributes to the literature by discussing (1) the reasons for the lack of blockchain adoption in a developing country by utilizing the TOE framework and the institutional theory; (2) benefits and challenges that the accounting and auditing profession could gain/face in adopting blockchain-based accounting ecosystems; and (3) suggestions for facilitating accounting and auditing to adopt blockchain technology. The TOE framework was



extended by adding additional factors under technological and environmental barriers: under the technological barriers, a new element, i.e., the lack of tech-infrastructures (e.g., digitized processes and payment facilities, national cloud) was introduced afresh, while environmental barriers were extended with two factors – getting the relevant stakeholders to agree to get connected to a common platform and ownership and control-related aspects. In relation to the institutional theory, examining the *lack of* isomorphic pressures is a novel perspective used in this study in adopting blockchain into accounting and auditing, illustrating that these pressures can be used from a new viewpoint.

It contributes to practice by (1) enabling managers, investors, and regulators, both locally and internationally, to identify the challenges of various technological advancements prevailing in developing countries before investing in these blockchain-related projects; and (2) providing professional accountants and auditors, an understanding on how the profession could be affected in future with the adoption of blockchain-based accounting ecosystems and what skills and knowledge are required to face this technological change.

The main limitation of the study is the use of interviews as the only data source due to the limited time available. In addition, the respondents were not willing to share any documentary evidence; nor was there an opportunity for observations within any of the respondents' organizations. Therefore, the findings are purely based on the information provided by respondents. Therefore, future research can focus on strengthening the results of this study through combinations of other data collection methods. For example, large sample surveys can be utilized to validate the findings of this study. In-depth case studies could also be encouraged when the adoption attempts of the organizations become evident in the future. In addition, the phenomenon can be analysed through other theoretical lenses apart from the ones used by this study, such as the Technology Acceptance Model (TAM); for using TAM, quantitative approaches would be more suitable. Further, this study identified the need to explore the level of understanding of the phenomenon 'blockchain', among the different professional groups such as IT professionals, auditors, and accountants through future studies.

### **Declaration of Conflicting Interests**

The authors declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

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## **Appendix 1: Adjusted Interview Guide after the Pilot Interviews**

### ***Questions Related to Blockchain Adoption***

- 1) Given that the blockchain based solutions are more trustworthy and beneficial for finance, accounting and auditing and various other operational functions, why is there a lack of adoption of Blockchain technology in Sri Lanka compared to developed countries?
  - 1.1) What specific technological, organizational and environmental challenges exist in Sri Lanka for blockchain adoption?
  - 1.2) Did the organization face compliance or regulatory related issues when implementing blockchain related solutions?
  - 1.3) How is the demand from tech savvy clients and other different organizations for blockchain related solutions?
  - 1.4) What is your opinion regarding the support that regulatory bodies provide for organizations to adopt blockchain based solutions?
  - 1.5) Would the organization be further motivated to research and implement blockchain solutions if the other organisations competing in the industry successfully implemented blockchain (peer pressure)?
  - 1.6) Does the industry-wise lack of blockchain adoption in Sri Lanka result in organizations not seeing it as a competitive necessity?
- 2) Should this technology be implemented in Sri Lanka?
  - 2.1) As a developing country what types of blockchain based solutions could be introduced to facilitate finance, accounting and auditing functions?
  - 2.2) How could the blockchain applications help developing countries like Sri Lanka to solve their problems and challenges? (E.g., to reduce institutional weaknesses, improve micro finance)

### ***Questions Related to Accounting and Auditing Sectors***

- 1) How will the adoption of blockchain benefit/challenge the accounting and assurance domains?
  - 1.1) Would the blockchain based solutions simplify routine work of the users, which in turn would positively affect the users' attitude towards adopting blockchain?
- 2) In order to move towards a blockchain based accounting information system in future what tasks will auditors and accountants have to perform in future, and which tasks may disappear?

- 3) What knowledge do accountants and auditors need to acquire to be ready to use blockchain based accounting information systems?
  - 3.1) Should any training be given to Sri Lankan professionals to make them ready to use Blockchain eco systems?
- 4) Will the blockchain based accounting information systems enable accountants and auditors to take immediate corrective actions, improve planning and control?
  - 4.1) Could the above-mentioned perceived usefulness of blockchain positively affect the attitude towards adopting blockchain?
- 5) How will the existing accounting and auditing processes and functions need to change to be equipped for blockchain adoption in future?
  - 5.1) Should there be parallel accounting and auditing standards or changes in existing standards for this blockchain transformation?
  - 5.2) What aspects should be considered if we are to introduce blockchain to accounting eco systems?