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Perceptions and barriers to blockchain adoption in auditing: Evidence from Big Four audit firms in Austria

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List of Abbreviation

GDP Gross Domestic Product

EBP European Blockchain Partnership

TOE Technology-Organization-Environment framework

ROI Return on investment

MiCA Markets in Crypto Asset Regulation

Abstract

Purpose - This study aims to explore auditor's perceptions of blockchain technologies in Austria, identify the factors influencing their adoption in auditing practice, and examine why blockchain remains largely a theoretical concept that has not yet achieved widespread implementation, even within major international audit firms.

Methodology - A qualitative research approach was adopted. Data were collected through 10 semi-structured interviews with auditors employed by Big Four firms operating in Austria. The collected data were analysed using the systematic qualitative analysis approach developed by Gioia et al. (2021).

Findings - The findings indicate that most auditors view blockchain as a promising technology capable of enhancing transparency in auditing processes. However, its practical application within the Austrian auditing environment remains limited. Blockchain is currently perceived more as a future direction for the profession than as a tool widely used in everyday audit practice. The study identified several interconnected barriers, which are interpreted through the Technology-Organization-Environment (TOE) framework.

Originality/Value - This study contributes to the literature on blockchain adoption in auditing by providing empirical evidence on auditors' perceptions within the Austrian context. Unlike much of the existing research, which focuses primarily on the potential benefits of blockchain technology, the present study concentrates on the factors that hinder its implementation. The findings may assist audit firms, professional associations, educational institutions, and regulators in developing digital transformation strategies and enhancing professional training programs.

Keywords- blockchain, auditing, Big Four, Austria

Type of Study-Qualitative empirical research

Abstrakt

Zielsetzung - Diese Studie untersucht die Wahrnehmung von Blockchain Technologien durch Wirtschaftsprüfer in Österreich, identifiziert die Faktoren, die ihre Einführung in der Prüfungspraxis beeinflussen, und analysiert die Gründe, weshalb Blockchain trotz ihres Potenzials bislang überwiegend ein theoretisches Konzept geblieben ist und selbst in großen internationalen Wirtschaftsprüfungsgesellschaften keine breite Anwendung gefunden hat.
Methodik - Es wurde ein qualitativer Forschungsansatz gewählt. Die Datenerhebung erfolgte mittels zehn halbstrukturierter Interviews mit Wirtschaftsprüfern, die in Big Four Gesellschaften in Österreich tätig sind. Die erhobenen Daten wurden mithilfe des systematischen qualitativen Analyseansatzes nach Gioia et al. (2021) ausgewertet.

Ergebnisse - Die Ergebnisse zeigen, dass die Mehrheit der Befragten Blockchain als eine vielversprechende Technologie betrachtet, die das Potenzial besitzt, die Transparenz von Prüfungsprozessen zu erhöhen. Dennoch bleibt ihre praktische Anwendung im österreichischen Prüfungsumfeld begrenzt. Blockchain wird derzeit eher als zukünftige Entwicklungsrichtung des Berufsstandes, denn als ein Instrument wahrgenommen, das bereits fest in der täglichen Prüfungspraxis verankert ist. Die Studie identifiziert mehrere miteinander verbundene Barrieren, die im Rahmen des Technology-Organisation- Environment (TOE) Frameworks interpretiert werden.

Originalität/Wert - Die Studie leistet einen Beitrag zur Literatur über die Einführung von Blockchain-Technologien im Prüfungswesen, indem sie empirische Erkenntnisse zur Wahrnehmung der Technologie durch Wirtschaftsprüfer im österreichischen Kontext liefert. Im Gegensatz zu einem Großteil der bisherigen Forschung, die sich vor allem auf die potenziellen Vorteile der Blockchain Technologie konzentriert, richtet die vorliegende Arbeit den Fokus auf die Faktoren, die ihre praktische Implementierung behindern. Die Ergebnisse können Wirtschaftsprüfungsgesellschaften, Berufsverbänden, Bildungseinrichtungen und Regulierungsbehörden bei der Entwicklung von Strategien zur digitalen Transformation sowie bei der Weiterentwicklung beruflicher Ausbildungsprogramme unterstützen.

Schlüsselwörter- Blockchain, Wirtschaftsprüfung, Big Four, Österreich

Art der Studie- Qualitative empirische Forschung

1. Introduction

In 2018, 29 European countries, including Norway and Liechtenstein, established the European Blockchain Partnership (EBP) with the aim of creating a secure and reliable digital infrastructure based on blockchain technology and implementing these technologies for citizens, public administrations, and businesses (European Commission, 2025, p. 1). According to PwC, blockchain adoption is expected to have a transformative impact on the global economy and could potentially increase global GDP by USD 1.76 trillion by 2030 through enhanced transparency (PwC Cyprus, 2020). Against the backdrop of the rapid digitalisation of the financial sector, blockchain is increasingly viewed as one of the most promising technologies capable of reshaping approaches to the verification and validation of financial information (Kitsantas & Chytis, 2022, p. 1156).

The development of blockchain technologies is gradually moving beyond the sphere of cryptocurrencies alone and is beginning to affect more traditional areas of financial management, accounting and auditing. Within the academic literature, blockchain is frequently described as a technology capable of increasing transparency, reducing the risk of data manipulation, automating control procedures and fundamentally transforming the architecture of financial auditing (Dai & Vasarhelyi, 2017, p. 6). Particular attention has been devoted to the potential of blockchain for continuous auditing, automated transaction verification, and the creation of an immutable audit trail that enables real-time tracking of changes in financial information (Abreu et al., 2025, p. 4).

In 2022, Austria announced plans to reform the digitalisation of tax law administration by initially allowing taxpayers to voluntarily submit accounting data for automated digital audits using algorithmic systems, with the long-term objective of preparing the framework for mandatory implementation across all companies (European Commission, 2022). These developments reflect a broader European trend towards the digitalisation of financial oversight and the integration of automated data analysis technologies into regulatory and auditing practices.

An additional impulse for the development of blockchain related regulation emerged with the adoption of Regulation (EU) 2023/1114 - MiCA (Markets in Crypto Assets Regulation), which aims to regulate crypto-assets, strengthen investor protection, and establish a more structured

regulatory environment for cryptocurrency-related activities (European Union, 2023). The introduction of MiCA has significantly increased attention towards the accounting treatment of crypto assets, the transparency of digital transactions, and the necessity of developing appropriate audit mechanisms. As a result, auditors increasingly face the need to analyse blockchain-based transactions, assess the reliability of digital assets, and understand the operational logic of distributed ledger systems.

At the same time, the auditing profession itself is undergoing a period of substantial transformation. In recent years, the industry has experienced a significant shortage of personnel, with fewer students choosing accounting and auditing as a field of specialisation, while the number of qualified professionals in the labour market continues to decline (Bundesministerium für Arbeit, Soziales, Gesundheit und Konsumentenschutz, 2024). Simultaneously, the volume of data requiring examination and verification continues to expand due to the growth of the digital economy, increasingly complex business structures, and the increase of Big Data. Under conditions of limited human resources, this intensifies pressure on financial control systems and increases the demand for technologies capable of automating parts of the audit process (Youssef et al, 2025, p. 2).

Furthermore, the increasing digitalisation of business processes has fundamentally changed the nature of audit evidence and the way auditors obtain assurance. Traditional audit procedures were developed in an environment where financial information was generated and stored within centralised systems controlled by individual organisations (Kitsantas & Chytis, 2022, p. 1143). However, contemporary business ecosystems increasingly rely on interconnected digital platforms, cloud computing, artificial intelligence, and distributed data infrastructures, creating new challenges for the audit profession (Leocadio et al., 2024, p. 6). Consequently, auditors are required not only to evaluate financial information but also to assess the reliability of the technological environments in which such information is generated, processed, and stored. These developments are particularly relevant for large international audit firms. Over the past decade, the Big Four firms have invested heavily in digital transformation initiatives, innovation laboratories, technology partnerships, and specialized services related to emerging technologies (Youssef et al., 2025, p. 2). Such investments reflect the growing recognition that future competitiveness within the auditing profession will depend increasingly on technological capabilities and the successful integration of digital solutions into professional practice. The Austrian context provides a particularly interesting setting for examining these dynamics.

Austria combines a highly developed financial sector, strong integration into the European regulatory framework, and an active commitment to digital transformation initiatives. At the same time, empirical evidence regarding the practical adoption of blockchain technologies within Austrian audit firms remains scarce.

Against this background, investigating blockchain adoption from the perspective of auditors themselves becomes particularly important. Auditors represent the key actors responsible for evaluating the usefulness, feasibility, and reliability of emerging technologies within professional practice. Their perceptions influence not only individual willingness to engage with new technological tools but also broader organizational decisions regarding investment, training, and implementation strategies (Leocadio et al., 2024, p.16). Therefore, analyzing how auditors perceive blockchain technologies offers an opportunity to better understand the practical realities of digital transformation within the auditing profession and to identify the conditions necessary for more extensive adoption in the future.

Despite the rising academic and professional interest in blockchain technologies, the practical implementation of blockchain within auditing remains underdeveloped. Existing studies largely focus on the theoretical benefits of blockchain adoption, including efficiency gains, transparency, automation, and cost reduction.

The scientific relevance of this study therefore lies in several dimensions. First, the study contributes to the still limited empirical literature examining blockchain adoption in auditing within the Austrian context. Second, it shifts the focus away from the predominantly optimistic narratives surrounding blockchain technologies and instead concentrates on the factors constraining their practical implementation. Rather than if technology automatically transforms auditing, this study views adoption as a gradual and complex process shaped by organizational structures, economic considerations, and regulatory conditions. By examining how auditors perceive the risks, benefits, and practical usefulness of decentralized technologies, the research seeks to explain why blockchain remains largely experimental even within technologically advanced organizations such as the Big Four firms. Accordingly, the study focuses on the Austrian auditing market to identify the factors that explain the gap between theoretical expectations and practical implementation. To achieve this objective, the following research questions are addressed:

R1: How do auditors in Austria perceive blockchain technologies and their potential impact on the auditing profession?

R2: Which factors influence the adoption of blockchain technologies within Austrian auditing practice?

R3: Why do blockchain technologies remain predominantly theoretical rather than practically implemented even within Big Four auditing firms?

The present study aims to contribute to the understanding of the early stages of digital transformation in auditing and to identify the factors that may shape the future development of blockchain adoption within the Austrian professional auditing environment.

2. Literature Review

2.1. Blockchain Technology and Auditing

In recent years, blockchain technology has become one of the most widely discussed areas of digital transformation within the financial sector. Despite the growing volume of research dedicated to blockchain, the academic literature still lacks a universally accepted definition of the technology. This can be attributed to the broad range of its applications, including financial services, public administration, logistics, accounting, and auditing. Depending on the research context, scholars emphasize different characteristics of blockchain, resulting in multiple interpretations of the concept.

Some researchers primarily view blockchain as a technology for data storage and digital recordkeeping (Appelbaum & Smith, 2018, p. 29). Others define it as a distributed ledger that enables the recording and verification of economic transactions between network participants without the need for a central intermediary (Dai & Vasarhelyi, 2017, p. 8). In its broadest sense, blockchain can be described as a decentralized information storage system in which data are recorded in sequential blocks and distributed across multiple network nodes, ensuring a high degree of reliability and resistance to unauthorized alterations (Guo et al., 2025, p. 3).

From an accounting and auditing perspective, blockchain is particularly valued for its ability to ensure transparency, traceability and immutability of data. Dai and Vasarhelyi (2017, p. 6)

argue that the technology enables the creation of a new architecture of financial information, where transactions can be verified almost in real time (Schmitz & Leoni, 2019, p. 336).

According to these authors, the development of blockchain systems may fundamentally reshape the mechanisms through which trust in financial reporting is established (Zheng et al., 2022, p. 2). A key advantage of blockchain lies in its capacity to generate trust among participants through cryptographic mechanisms and distributed data storage (Macrinici et al., 2018, p. 2338). Since previously recorded information cannot be altered, blockchain creates a transparent environment in which every transaction can be independently verified by network participants (Dai & Vasarhelyi, 2017, p. 5). This feature makes the technology particularly attractive for accounting and auditing, where the reliability and verifiability of information are fundamental requirements.

The literature consistently highlights that the integration of blockchain into accounting processes can significantly reduce the risk of data manipulation, strengthen information security, and provide more reliable storage of financial information (Zheng et al., 2022, p. 2). Unlike traditional centralized databases, distributed ledgers maintain a permanent record of transactions, creating additional opportunities for monitoring and verification of financial data (Macrinici et al., 2018, p. 2338).

From a technical perspective, each record within a blockchain is linked to the previous one through cryptographic hashing. Any attempt to alter previously recorded information would compromise the integrity of the entire chain, making such modifications practically impossible without the consent of most network participants (Appelbaum & Smith, 2018, p. 28). This characteristic is widely regarded as one of the most promising applications of blockchain within the auditing profession.

2.2. Potential Benefits of Blockchain in Auditing

There is broad agreement among researchers that blockchain technology can considerably drive the development of the auditing profession. Some scholars argue that blockchain may transform both the methods used to collect audit evidence and the overall approach to conducting audit procedures (Dai & Vasarhelyi, 2017, p. 10).

Traditional auditing relies on the periodic examination of financial information through sampling procedures. Auditors review only a portion of an organization's transactions and use the findings to form an opinion regarding the reliability of financial statements (Dai & Vasarhelyi, 2017, p. 10). Against this backdrop, blockchain has been identified as a technology capable of supporting the concept of continuous auditing. Unlike traditional auditing, continuous auditing involves ongoing monitoring of transactions and the timely detection of irregularities in real time. Due to the existence of an immutable digital audit trail, each transaction can be verified now it occurs (Schmitz & Leoni, 2019, p. 336).

In addition, several researchers associate blockchain development with the concept of triple-entry bookkeeping. Unlike traditional double-entry accounting, where transactions are recorded separately by both parties, triple-entry bookkeeping involves the additional validation of transactions within a distributed ledger (Thies et al., 2023, p. 104). This approach is expected to enhance trust in financial information and reduce the need for separate reconciliation procedures (Dai & Vasarhelyi, 2017, p. 10).

According to Appelbaum and Smith (2018, p. 36), blockchain can automate a substantial portion of routine tasks related to transaction verification. This has the potential to free auditors from repetitive activities and allow them to focus on more complex analytical procedures that require professional judgment.

Despite these advantages, most authors emphasize that blockchain is unlikely to replace auditors entirely. Even in environments supported by distributed ledgers, auditors remain responsible for assessing the appropriate recognition of transactions, interpreting the economic substance of events, and forming professional opinions. In other words, blockchain may alter the nature of auditors' work but does not eliminate the need for professional expertise (Schmitz & Leoni, 2019, p. 337-338).

Over the past several years, major international audit firms have invested substantial resources in the development of blockchain-related solutions. Deloitte introduced the COINIA platform for analysing digital assets and blockchain transactions (Deloitte, 2019). EY developed Blockchain Analyzer, which enables the monitoring of cryptocurrency transactions and the analysis of distributed ledger data (Ernst & Young, 2023). PwC implemented the HALO platform to improve data analysis and audit quality (PwC Deutschland, 2024). KPMG

integrated Chain Fusion into its KPMG Clara system to facilitate auditing within cryptocurrency and blockchain environments (KPMG LLP, 2025, p. 1).

At first glance, these initiatives may suggest widespread adoption of blockchain technology in Big Four companies all over the world. However, several studies indicate that blockchain implementation within traditional auditing has progressed much more slowly than initially anticipated (Georgiou et al., 2024, p. 1; Kitsantas & Chytis 2022, p. 1157). Despite ongoing discussions within the profession, blockchain-based auditing has not yet developed significantly in scope and is often confined to pilot projects. This situation suggests that additional barriers exist, and these barriers remain insufficiently explored in the current literature.

2.3. Barriers to Blockchain Adoption in Auditing

An increasing number of studies suggest that the successful integration of blockchain depends not only on the technology itself but also on a combination of factors related to organizational readiness, professional competencies, and the external institutional environment (Thies et al., 2023, p. 112).

One of the most frequently discussed categories of barriers relates to technological challenges. These include difficulties in integrating blockchain solutions with existing organizational information systems, the absence of common technological standards, and issues concerning scalability (Youssef et al., 2025, p. 3).

Additional challenges arise from the technical complexity of distributed ledger systems, which require specialized knowledge of cryptography, blockchain architecture, and smart contracts. The literature further indicates that technological barriers extend beyond infrastructure related issues. Georgiou et al. (2024, p. 2) argue that existing accounting software and information systems are often incompatible with blockchain based solutions, making integration costly and operationally complex. The transition from traditional accounting infrastructures to blockchain-enabled environments frequently requires substantial modifications to existing systems and workflows (Georgiou et al., 2024, p. 2). As a result, many organizations remain hesitant to undertake large scale implementation projects due to concerns regarding costs, technical risks, and operational disruptions.

Privacy and confidentiality concerns represent another important technological obstacle. While blockchain is commonly associated with increased transparency, audit firms simultaneously operate under strict confidentiality requirements regarding client information. Georgiou et al. (2024, p. 2) note that concerns regarding privacy and the storage of sensitive business data continue to limit the adoption of blockchain solutions. Although emerging technologies such as homomorphic encryption and sidechain architectures have been proposed as potential solutions to these challenges, their practical application remains relatively limited and often lacks sufficient maturity for widespread implementation (Georgiou et al., 2024, p. 2).

Furthermore, the technical complexity of blockchain systems may create additional operational risks. According to Maffei et al. (2021, p. 471), the relatively slow adaptation process associated with blockchain technologies may lead accounting and auditing professionals to underestimate risks arising from their incorrect use. Insufficient understanding of blockchain based systems can expose organizations to cybersecurity threats, legal complications, and operational inefficiencies capable of undermining the reliability of accounting and auditing processes (Maffei et al., 2021, p. 471). Consequently, successful implementation requires continuous system monitoring, regular updates, and effective risk management mechanisms.

In addition to technological barriers, organizational and human resource factors play a critical role in shaping blockchain adoption. The implementation of new technologies requires substantial investments in employee training and the adaptation of internal processes (Zheng et al., 2022, p. 12). At the same time, many auditors continue to possess limited experience with blockchain technologies and digital assets, reducing organizations readiness for large scale innovation initiatives (Ziemba et al., 2024, p. 535).

The successful implementation of blockchain therefore depends not only on technological readiness but also on the availability of appropriate professional competencies. According to Ziemba et al. (2024, p. 532), organizations seeking to implement blockchain successfully must invest in internal education programmes, develop dedicated blockchain strategies, and identify relevant use cases before implementation begins. Without adequate preparation, organizations may struggle to integrate blockchain effectively into existing auditing processes (Ziemba, 2024, p. 532).

Organizational resistance to change also constitutes a significant barrier. As noted by Georgiou et al. (2024, p. 2), established procedures, existing software systems, and long-standing professional practices may reduce the willingness of organizations and employees to experiment with unfamiliar technological solutions. Consequently, resistance to organizational change may delay blockchain adoption even when the technology itself is available and technically feasible.

External factors also play a significant role. Although the regulatory framework for crypto assets within the European Union has evolved, particularly through the introduction of the MiCA Regulation, many aspects of blockchain usage in auditing remain insufficiently regulated (European Union, 2023, p. 40). The absence of uniform professional standards and methodological guidance creates additional uncertainty for audit firms and limits the broader adoption of the technology.

Moreover, Ziemba et al. (2024, p. 532) emphasize that successful blockchain adoption requires a structured pre implementation process that includes cost benefit analysis, governance mechanisms, internal controls, and implementation planning. Organizations must carefully evaluate whether blockchain solutions align with their operational requirements and regulatory obligations before committing to large scale implementation. The absence of such preparation may significantly increase implementation risks and reduce the likelihood of successful adoption (Ziemba, 2024, p. 532).

A review of the academic literature indicates that the implementation of blockchain technology in auditing is accompanied by several significant barriers that extend far beyond purely technical issues. Therefore, the adoption of blockchain should be viewed as a large-scale organizational transformation that requires coordinated efforts among various stakeholders and careful consideration of numerous interrelated factors.

To analyse these barriers. this study adopts the Technology Organization Environment (TOE) framework developed by Tornatzky and Fleischer (1990). According to the TOE model, the adoption of technological innovation is influenced by three dimensions: technological characteristics, organizational conditions, and environmental factors. The framework provides a comprehensive basis for examining both the barriers and drivers associated with blockchain adoption in auditing organizations (Clohessy et al., 2018, p. 1461). Given the multidimensional

nature of blockchain implementation identified in the literature, the TOE framework offers an appropriate theoretical lens through which the adoption barriers perceived by auditors can be systematically analysed.

2.4. Research Gap

Although blockchain technology has attracted considerable attention within auditing research, several important issues remain insufficiently explored. Existing studies predominantly concentrate on the potential advantages of blockchain, such as automation of audit procedures and facilitate real time continuous audit mechanisms. As a result, the current discussion is largely shaped by the technological potential of blockchain rather than by a comprehensive understanding of the organisational and industry specific factors required for its successful implementation. While the advantages of distributed ledger technologies have been extensively examined, less attention has been devoted to the challenges that may prevent audit firms from integrating such technologies into everyday professional practice.

Another limitation of the literature relates to the nature of the available empirical evidence. Most studies are conceptual, or technology oriented and emphasise conceptual contributions and theoretical considerations rather than industry applications. As a result, relatively little is known about auditors' perceptions of blockchain, including how they evaluate its relevance for audit engagements and what concerns influence their acceptance of the technology. Since adoption decisions in audit firms depend on practitioner’s judgments, the lack of auditor centred empirical evidence represents a significant research gap.

In addition, a clear discrepancy exists between the growing attention to blockchain in academic and professional discourse and its limited implementation in audit practice. Although large international audit firms have invested considerable resources in blockchain related initiatives, evidence of widespread adoption has not yet reached a substantial level. This suggests that the existence of technological capabilities alone may not be sufficient to drive adoption. Organisational priorities, professional norms, resource availability, regulatory uncertainty, and perceptions of usefulness may collectively influence implementation decisions. However, the interaction between these factors has not yet been examined in sufficient depth.

The literature also provides limited insight into how blockchain adoption is shaped by specific national and institutional contexts. Most existing studies investigate blockchain from a global perspective or focus on jurisdictions where digital asset markets are particularly developed. Comparatively little attention has been given to Austria, despite its active participation in European digitalisation initiatives and its integration into the evolving European regulatory framework. As a result, there is currently limited empirical evidence regarding how auditors operating within the Austrian environment interpret the opportunities and challenges associated with blockchain technologies.

Overall, these gaps highlight the need for empirical research focused on auditors lived experiences and professional judgments regarding blockchain adoption. By examining how auditors within Big Four firms in Austria perceive the value and limitations of blockchain technology, this study aims to contribute to a more practice-oriented understanding of its implementation and to bridge the gap between theoretical expectations and audit practice, provides an opportunity to better understand the organisational, professional, and environmental factors influencing adoption.

3. Methodology

3.1. Approach to Research

This study adopts a qualitative research approach aimed at gaining a deeper understanding of how blockchain technologies are perceived within the professional auditing community, as well as identifying the hidden barriers and factors that hinder their practical implementation in Austrian auditing firms.

In contrast to quantitative methods, a qualitative approach provides a deeper and more detailed understanding of participants' professional experiences, perceptions, and viewpoints. Such an approach is particularly important when examining new and underexplored phenomena, as it allows the researcher to identify not only formal aspects of the issue but also subjective interpretations, professional concerns, and hidden organizational limitations (Makateng & Makala, 2025, p. 328, 333). Accordingly, the qualitative design of this study made it possible to explore how auditors from Big Four companies perceive blockchain technologies, evaluate their potential, and explain why the implementation of these technologies have not yet moved beyond conceptual discussion into routine use.

Moreover, the choice of a qualitative research design was influenced by the exploratory nature of the study. As blockchain technology is still not widely implemented within auditing practice in Austria, many of the factors influencing its adoption remain insufficiently documented in existing research. A qualitative approach allows participants to discuss their experiences, expectations, and concerns in their own words, thereby providing insights that may not emerge through structured quantitative instruments. This is particularly relevant in the context of technological innovation, where organisational realities often differ from theoretical assumptions presented in the literature.

The selection of auditors from Big Four firms in Austria as the primary research group is justified by the fact that these organizations are considered technological leaders within the auditing industry and potentially possess the greatest organizational, professional, and technical capabilities for implementing innovative digital solutions, including blockchain technologies. Examining the perspectives of professionals working within these firms provides a comprehensive reflection of the current state of blockchain adoption in the Austrian auditing environment. In addition, Big Four firms are often among the first organizations to experiment with and adapt new digital tools in auditing practice, making them particularly relevant for studying processes of technological transformation within the profession. Investigating the views of specialists from these firms also allows for the identification of professional, organizational, and institutional factors influencing the pace of innovation adoption in the auditing sector.

Big Four firms play a significant role in shaping industry practices and technological developments within the auditing profession. Due to their extensive client portfolios, international networks, and continuous investments in digital transformation initiatives, these firms are frequently among the first to evaluate, test, and implement emerging technologies. Consequently, auditors employed within such organisations are likely to possess valuable insights into both the opportunities associated with blockchain technology and the practical challenges that may limit its broader implementation. Their perspectives therefore provide an important source of information for understanding how technological innovations are assessed and adopted within large professional service firms.

Interviews are considered one of the most appropriate methods for qualitative data collection.

Consequently, semi-structured interviews were selected as the primary method for this study, as they allow the combination of a predefined interview structure with the opportunity for respondents to provide detailed and elaborate answers. This interview format facilitates the identification of deeper aspects of professional perceptions related to the research topic while also enabling participants to freely express their views and share their practical experiences (Qu & Dumai, 2011, p. 246).

For data collection, an interview guide was developed consisting of open-ended questions grouped around the key thematic areas of the study. The interviews covered the following topics:

1. Practical experience with blockchain technologies.
2. Perceptions of blockchain implementation in auditing.
3. Challenges related to the analysis of blockchain transactions and blockchain-based audit evidence.
4. Potential barriers to blockchain adoption in Austria.
5. The influence of blockchain technologies on the future of the auditing profession.

3.1. Data Collection Strategy

To ensure the practical relevance of the study, a convenience sampling method was applied, including respondents who demonstrated a strong interest in the research topic as well as professionals recommended by previously interviewed experts. This approach made it possible to involve participants possessing professional experience in auditing and at least a basic understanding of blockchain technologies.

Each interview lasted between 20 and 40 minutes and was conducted using a previously developed questionnaire reflecting the main research themes. The semi-structured interview format enabled respondents to provide detailed answers, elaborate on their perspectives, and share professional experiences in depth. All interviews were conducted online. The online format facilitated the organization of the data collection process and allowed respondents to participate without the need for physical presence. Moreover, this format enabled more flexible scheduling and simplified communication with participants working under conditions of high professional workload.

Data collection was conducted between January and April 2026 and included ten semi-structured interviews. Respondents were selected based on their professional activities in the auditing field and their employment within Big Four companies in Austria. To participate in the study, respondents had to meet the following criteria:

1. Be employed as auditors in one of the Big Four firms in Austria.
2. Have at least three years of professional experience.
3. Possess at least a basic understanding of blockchain technologies.

The final sample consisted of ten auditors from KPMG, Deloitte, EY, and PwC. Participants occupied various professional positions, including Audit Associate, Senior Associate, Audit Manager, Senior Audit Manager, and Partner. Their professional experience ranged from 3 to 22 years. This distribution of participants made it possible to include both the perspectives of junior professionals directly involved in daily audit procedures and the views of more experienced managers possessing a strategic understanding of the development of the auditing profession and digital technologies. The diversity of professional positions also contributed to a more comprehensive understanding of the barriers to blockchain adoption across different organizational levels within auditing firms.

The number of interviews was determined by the principle of information richness rather than by a predefined numerical target. During the later stages of data collection, participants increasingly referred to similar challenges, expectations, and observations regarding blockchain adoption in auditing. As no substantially new perspectives emerged during the final interviews, the collected data were considered sufficient to address the research objectives and support a meaningful thematic analysis.

The characteristics of the interview participants are summarized in Table 1. The table provides an overview of the respondents' professional positions, employing firms, years of auditing experience, interview duration, and interview language. Presenting this information facilitates a clearer understanding of the composition of the sample and demonstrates the diversity of professional backgrounds represented in the study. The inclusion of participants from different hierarchical levels within the Big Four firms allows the analysis to capture perspectives from both operational and managerial levels of auditing practice.

The interviews were conducted in German. Subsequently, the responses were translated into English and edited to ensure the accuracy of formulations and to prepare the material for qualitative analysis. The interview guide was developed from the interview protocol developed by Abdennadher et al. (2022), who explored the effects of blockchain technology on the accounting and assurance profession in the United Arab Emirates. However, considering the still limited practical adoption of blockchain technologies in Austria, the questions were additionally adapted to the specific research context to identify not only the current use of blockchain technologies but also the key barriers preventing their implementation and practical application in auditing activities. This adaptation of the interview questions made the study more relevant to the current conditions of the Austrian auditing market and allowed for a stronger focus on the practical limitations faced by professionals in relation to the potential implementation of blockchain based solutions.

Interview number	**Profession level**	**Position**	**Firm**	**Gender**	**Year of experience**	**Interview duration**	**Language**
R1	Audit	Partner in Audit in the Financial Service sector	KPMG	Male	22	36 min	German
R2	Audit	Senior Manager Audit	EY	Male	14	40 min	German
R3	Audit	Audit Manager	KPMG	Male	9	29 min	German
R4	Audit	Audit Associate	PWC	Famale	3	38 min	German
R5	Audit	Audit Senior Associate	Deloitte	Female	4	31min	German
R6	Audit	Audit Senior Associate	PWC	Famale	5	25 min	German
R7	Audit	Audit Associate in	EY	Female	4	35 min	German

		Financial Service Assurance					
R8	Audit	Audit Senior Associate	Deloitte	Female	5	20 min	German
R9	Audit	Audit Associate	Deloitte	Female	3	24 min	German
R10	Audit	Audit Associate	KPMG	Male	3,5	35 min	German

Table 1. Descriptive summary of the interviews.

The research process was conducted with continuous ethical considerations. Participation in the study was entirely voluntary, and all respondents were made aware of the purpose of the research before the interviews commenced. Participants were assured that their responses would be treated confidentially and reported in anonymised form. To protect their identities, respondents are referred to only by participant codes (R1-R10), and no personally identifiable information is disclosed.

3.2. Data Analysing Process

The collected data were analysed using the systematic qualitative data analysis approach developed by Gioia et al. (2021). This methodology was selected due to its ability to ensure a high level of analytical transparency, rigor, and consistency in the interpretation of qualitative empirical data. The Gioia method enables researchers to identify emerging patterns within empirical findings, uncover previously unexplored aspects of the researched phenomenon, and develop a structured system of relationships between the identified categories (Gioia et al., 2021, p. 26).

The use of the Gioia methodology enabled the study to maintain a clear chain of evidence between the empirical material and the final theoretical interpretations. By systematically linking participants' statements to progressively higher levels of abstraction, the analysis ensured analytical transparency and enhanced the credibility of the findings. The resulting framework served as the basis for the discussion of the empirical results in the following chapter. The selection of the Gioia methodology was guided by the specific objectives of this study. The research seeks to explore how auditors interpret and make sense of blockchain

technology within their professional environment rather than to verify predefined theoretical assumptions. Given the limited practical adoption of blockchain in auditing and the still fragmented nature of the existing evidence, it was important to employ an analytical approach capable of capturing perspectives that emerge directly from participants' experiences. The Gioia methodology offers a structured framework for this purpose by allowing concepts to develop progressively from the empirical material while preserving a visible connection between respondents' accounts and the final analytical categories. This approach was particularly valuable for examining a phenomenon that is still evolving in practice and for identifying factors that may not yet be fully reflected in the existing literature. In addition, the method supports the development of a transparent analytical process, making it possible to demonstrate how individual observations were transformed into broader themes and conceptual dimensions throughout the study.

The analysis process started with examination of the interview material and detailed familiarization with all transcripts. Prior to the coding stage, key statements and recurring expressions used by the respondents were identified. These statements were primarily related to the implementation of blockchain technologies, technological complexity, organizational resistance, lack of market demand, the transformation of the auditing profession, trust in blockchain systems, and the level of professional preparedness among auditors. These elements were classified as verbatim expressions and served as the basis for the subsequent coding process.

During the first stage of analysis, first order concepts were developed. This stage followed a predominantly inductive approach and relied on preserving the original terminology and expressions used by the respondents themselves. The identified verbatim statements were subsequently grouped into broader conceptual categories. As a result, several first order concepts were identified, including lack of market demand, professional scepticism, technological complexity, regulatory uncertainty, shortage of qualified professionals, and the transformation of the auditor's role.

Table 2 provides an overview of the first stage of the coding process. It illustrates how individual statements expressed by the interview participants were systematically transformed into first order concepts while preserving the original meaning of the respondent’s accounts. Following the principles of the Gioia methodology, emphasis was placed on retaining

participants' own language wherever possible to minimise premature theoretical interpretation and ensure that the emerging concepts remained grounded in the empirical data.

Respondent number	RELEVANT VERBATIM (QUOTES)	1st-ORDER CODES
R1	*"Analysing blockchain data is often challenging, primarily due to its technical structure. Untike traditional accounting systems, the data is not always available in a structured format familiar to auditors."*	**Complexity of Blockchain System**
R2	*"…complex, especially for auditors without a technical background..."*	
R5	*"Large volumes of data and the question of how to interpret them meaningfully are paramount. Simply viewing transactions is insufficient..."*	
R9	*"...data volumes are large, and the structure is unfamiliar. Without technical understanding, you quickly reach your limits. I personally would definitely need to get support… since errors persist; you can't simply delete them. Corrections are made via new entries. I imagine that would be quite time-consuming for the audit..."*	
R1	*"Errors are therefore not corrected by changes, but rather by additional corrective transactions."*	
R10	*"Bitcoin, for example, is criticized for its high energy consumption. I don't believe the situation is much better for blockchain in general, as the amount of data will continue to grow."*	**Infrastructure Burden**
R2	*"...the main challenges are high infrastructure requirements, integration efforts with existing systems..."*	
R10	*"...errors... they can't simply be fixed-they remain in the system; only adjustments can be made. From an auditing perspective, this presents more of a complication..." "...enormous amounts of information need to be analysed and understood. And the fundamental question remains: How can all of this be scaled, where should the data be stored, and how should it be processed..."*	**Data Structure and interpretation**
R8	*"Handling corrections seems rather complicated."*	
R6	*"...we are now focusing primarily on artificial intelligence..."*	**Strategic Competition of Technologies**
R3	*"...artificial intelligence, for example, currently has a significantly greater impact on everyday work than blockchain..."*	
R5	*"For Austria, two key points stand out: the crypto industry plays a rather minor role economically..."*	
R7	*"...Companies are currently investing more in technologies that are quicker to integrate, easier to understand, and immediately applicable…"*	
R5	*"The influence of other technologies, such as Al, is currently much more noticeable…"*	
R1	*"...there are still not fully developed, universally applicable, and universally usable solutions for blockchain-based accounting systems..."*	**Technological Immaturity**
R3	*"...we see that the solutions aren't mature yet..."*	
R1	*"...the data is not always directly interpretable and requires additional technical knowledge and suitable analytical tools..."*	
R5	*"...practical implementation is still lacking..."*	**Theory-practice Gap**
R7	*"...believe many teams lack practical experience and insufficient access to clients who are using blockchain..."*	
R9	*"...difficult adaptation and integration into daily routines as one of the main reasons why this is developing rather slowly..."*	
R10	*"Right now, it's more theory than practical experience..."*	

R4	*"...blockchain plays virtually no role in my daily..."*	
R2	*"...My experience in this area is more theoretical..."*	
R1	*"... the lack of practical experience, specific knowledge, and understanding of this technology..."*	
R6	*"The biggest challenge is understanding the processes themselves. For the average auditor, blockchain often remains completely new and incomprehensible..."*	**Lack of Blockchain Literacy**
R7	*"...blockchain significantly improves traceability... this does not automatically simplify matters for the auditor, as the data can be technically complex and require a deeper understanding of the blockchain structure..."*	
R8	*"...my understanding is rather basic. I primarily associate the topic with cryptocurrencies, but I lack a concrete connection to auditing…many lack even a basic understanding of the technology…"*	
R9	*"...the technology isn't quite mature yet..."*	
R4	*"…auditors need to expand their traditional role …this is no longer just auditing; it's partly IT auditing and systems analysis…"*	**Profession Transformation/ Hybridization**
R6	*"… blockchain requires entirely different skills for data verification...impact will be enormous. The role of the auditor will shift towards IT consulting. We will become algorithm experts rather than traditional accountants..."*	
R9	*"...more technical understanding. Probably more IT people on the team and generally more training..."*	
R10	*"...the role of the auditor itself will likely become more IT-oriented..."*	
R1	*"...This task falls within the scope of IT auditing..."*	
R7	*"...for actual widespread application, additional tools and training would be necessary...the main barriers are a lack of experience and knowledge..."*	**Talent Shortage**
R10	*"...not everyone has this knowledge. Young professionals may have basic theoretical knowledge from their studies, but more experienced auditors often need additional training...such topics need more attention at the university level as well…"*	
R2	*"...additional training requirements, and adjustments to existing audit processes..., It is difficult to rely on algorithmic systems without fully understanding how they function..."*	
R2	*"...open regulatory questions, particularly regarding the legal status of smart contracts and the handling of potential systemic errors..."*	**Regulatory Uncertainty**
R3	*"...Insufficient regulatory frameworks for crypto assets and smart contracts..."*	
R7	*"...blockchain is not yet recognized as universally valid evidence for audits in Austria..."*	
R3	*"...implementation involves considerable costs, while client demand remains restricted..."*	**Unclear ROI**
R4	*"I wouldn't actively push for its introduction at this time. Not because the technology is bad, but because it's not yet integrated into the economic logic of auditing. Auditing also means efficiency - time, budget, client expectations..."*	
R1	*"...there is often a lack of undeniable economic advantages, and this discourages companies from investing in this technology..."*	
R3	*"…low awareness of the technology's concrete benefits..."*	**Unclear Value Added**
R8	*"My clients don't see any benefit from it...."*	
R4	*"...many don't see any concrete added value in their daily work - and fragmented knowledge - there are specialists, but not a broad understanding..."*	
R2	*"...the technology is not yet sufficiently integrated into existing auditing standards and methods..."*	**Low Market Penetration**

R6	*"As long as our clients do not adopt this technology across the board, there is no urgent need for us to restructure our processes..."*	**Weak External Pressure**
R8	*"It's not relevant to our market right now. It may be further along in other countries, but there's no noticeable need here..."*	**Ecosystem Weakness**
R8	*"The main reason is the lack of relevance. Cryptocurrencies have little economic significance in Austria, unlike in some other countries..."*	
R5	*"...in Austria, the field is developing cautiously, which is understandable given the current market situation..."*	
R2	*"...promising, but rather niche area..."*	**Lack of Demand**
R3	*"...actual implementation will depend heavily on demand and regulatory developments..."*	
R2	*"...limited client demand..."*	
R6	*"...digitization and the switch to smart contracts require massive investments in IT infrastructure and personnel, which is not feasible for every company. As long as our clients do not adopt this technology across the board, there is no urgent need for us to restructure our processes..."*	
R2	*"My attitude toward blockchain technologies… with a certain degree of professional scepticism… such data must be scrutinized just as critically as other sources of information..."*	**Professional Scepticism**
R4	*"...blockchain doesn't solve the problems of auditing..."*	
R3	*"...verifying the data and systems remains necessary..."*	**Requirement for Verification**
R1	*"…auditors cannot simply assume that data is correct just because it is stored on a blockchain. The integrity and functionality of the system must first be validated as part of an IT audit...."*	
R4	*"...we're not eliminating trust, but shifting it toward code, system architecture, and the people who develop these systems..."*	**System Distrust**
R8	*"...my trust is rather limited. Without a clear understanding, it is difficult to rely on it..."*	
R4	*"Fraud can occur even before storage…trust is shifting: less focus on the data itself, more on the processes behind it..."*	
R10	*"Risks remain-access, keys, human error..."*	
R9	*"...risks are emerging- for example, cyberattacks, unauthorized access to wallets or private keys. Data privacy is another issue...."*	
R3	*"...Theoretically, blockchain can increase the reliability of data because it cannot be altered retroactively. However, this does not mean that the data is automatically correct. If information is entered incorrectly, it is stored unchanged...I wouldn't speak of unconditional trust. The technology only protects against subsequent changes..."*	

Table 2. First order coding structure.

The examples presented in the table represent illustrative quotations selected from the interview material and demonstrate the analytical logic used during the coding process. The first order concepts served as the foundation for the subsequent development of higher-level themes and aggregate dimensions discussed in the following stages of the analysis.

At the second stage of analysis, the first order concepts were grouped and interpreted into more theoretically oriented second order themes. This stage aimed to structure the empirical findings

into a more coherent analytical system reflecting the major categories of barriers hindering the development and integration of blockchain technologies within Austrian auditing practice. The second order themes included technological barriers, organizational barriers, institutional and regulatory barriers, economic and market barriers, as well as strategic and professional cultural barriers.

At the final stage of the analysis, the second order themes were further examined and aggregated into broader aggregate dimensions, integrating interconnected themes into higher level analytical categories. Within the context of this research, the aggregate dimensions were used to conceptually explain the different levels at which barriers to blockchain adoption emerge within the Austrian auditing environment.

1st-ORDER CODES	**2nd-ORDER THEMES**	**3rd- ORDER AGGREGATE DIMENSIONS**
Complexity of Blockchain System	**T1. Technological Barriers**	**Technological (T) Level**
Infrastructure Burden		
Data Structure and interpretation		
Strategic Competition of Technologies		
Technological Immaturity		
Theory-practice Gap	**T2. Organizational Barriers**	**Organizational (O) Level**
Lack of Blockchain Literacy	**T3. Human Capital Barriers**	
Profession Transformation/ Hybridization		
Talent Shortage		
Unclear ROI	**T4. Economic Barriers**	
Unclear Value Added		
Low Market Penetration	**T5. Market and Strategic Barriers**	**Environmental (E) Level**
Weak External Pressure		
Ecosystem Weakness		
Lack of Demand		
Regulatory Uncertainty	**T6. Institutional and Regulatory Barriers**	
Professional Skepticism	**T7. Professional-Cultural Barriers**	
Requirement for Verification		
System Distrust		

Table 3. Aggregate dimensions derived from Gioia analysis.

To provide a transparent overview of the analytical procedure, Table 3 presents the complete coding structure developed throughout the study. The table demonstrates how the analysis progressed from empirically grounded first order concepts to more abstract second-order

themes and, ultimately, to aggregate dimensions. This hierarchical structure reflects the core principle of the Gioia methodology, namely the systematic movement from participants lived experiences toward increasingly theoretical levels of interpretation.

The coding structure also highlights the multidimensional nature of blockchain adoption barriers identified in the interviews. Rather than being driven by a single factor, the findings indicate that technological, organisational, human capital, economic, regulatory, and professional-cultural considerations interact simultaneously and collectively shape adoption decisions within Austrian audit firms. The resulting framework therefore provides a comprehensive representation of the factors influencing blockchain implementation from the perspective of audit practitioners.

4. Findings

The findings of this study provide a detailed empirical overview of the status of blockchain technology within Austrian auditing practice, with a particular focus on Big Four firms in Austria. Overall, the results indicate that blockchain is widely recognized in terms of its potential relevance but is only rarely integrated into everyday audit activities. While respondents consistently acknowledged its theoretical potential particularly in relation to transparency, traceability, and audit trail integrity the actual use of blockchain in audit processes remains limited and fragmented.

Across all interviews, a recurring pattern emerged: blockchain is primarily viewed as a future oriented innovation rather than a tool currently used in everyday auditing. This view is not merely theoretical but reflects the actual lack of structured implementation within most audit environments. Even in organizations with strong digital transformation initiatives, blockchain is rarely incorporated into core audit methodologies, and its use is largely restricted to pilot projects, experimental tools, or specialized advisory services related to digital assets.

At the same time, the data show that auditors do not consider blockchain irrelevant. Instead, they assess it from a practical perspective, evaluating its usefulness in relation to existing audit needs, regulatory requirements, and available technological alternatives. This practical approach contributes to a generally cautious attitude, in which blockchain is neither rejected nor fully adopted, but rather regarded as a technology with a limited range of applications.

A key outcome of the Gioia based analysis is the identification of several interconnected barriers that help explain the limited adoption of blockchain in auditing practice. These barriers do not exist independently but operate across different levels of the auditing environment, including technological infrastructure, organizational structures, market conditions, professional competencies, regulatory frameworks, and professional culture.

4.1. Technological Barriers

One of the most significant barriers to the adoption of blockchain technology identified by the respondents was the high technological complexity of blockchain systems, the strategic competition posed by existing technologies, and the absence of mature and reliable solutions. Most participants in the study noted that the structure of blockchain data differs substantially from traditional accounting systems, thereby creating additional challenges for auditors.
Interviewees emphasized that despite the high level of blockchain transparency resulting from the immutability of transactions, the analysis and interpretation of blockchain data remain highly complex.

One auditor stated: “Yes, analysing blockchain transactions can be complex. This is mainly because the data structure differs significantly from traditional accounting systems and requires a certain level of technical understanding. For many auditors, this represents an additional barrier.” (Respondent 3)

Several respondents also pointed out that the analysis of blockchain data requires well developed and reliable analytical tools, as well as a deep understanding of the system architecture. According to one participant: “In practice, blockchain data is often presented in a highly technical format and cannot be readily interpreted without specific expertise. This requires additional skills as well as appropriate analytical tools.” (Respondent 2)

Another important technological issue relates to the absence of mature and standardized blockchain audit solutions. Respondents frequently described current tools as experimental, fragmented, or limited in scope. Rather than being integrated systems, existing solutions are viewed as separate applications developed for specific purposes, particularly within crypto asset auditing. This lack of maturity creates uncertainty regarding reliability, scalability, and long-term use in professional audit settings.

In addition, blockchain introduces infrastructural challenges that go beyond data interpretation. Due to the continuously growing nature of distributed ledgers, respondents raised concerns about long term data storage, processing capacity, and system scalability.

As one respondent noted: “In practice, we see that the solutions are still not fully mature.” (Respondent 3)

A similar perspective was expressed by another respondent: “However, within the organization, blockchain is regarded as suitable for fairly limited, specialized applications, not as a broadly applicable solution.” (Respondent 1)

This infrastructural dimension is closely linked to cybersecurity considerations. Several respondents pointed out that blockchain based systems require strong security frameworks, not only at the protocol level but also within the organizational. architecture. The integration of blockchain into existing enterprise systems would therefore require significant investments in cybersecurity infrastructure, system integration, and ongoing maintenance.

Another important finding is the perceived competition between blockchain and other emerging technologies. Many respondents explicitly compared blockchain with artificial intelligence, automation tools, and advanced analytics systems. In this comparison, blockchain is often viewed as less immediately impactful, particularly in terms of efficiency improvements and operational integration into daily audit tasks. As a result, organizations tend to prioritize technologies that provide faster and more visible improvements in audit efficiency.

This competitive dynamic strengthens the perception of blockchain as a secondary innovation stream rather than a central driver of audit transformation. Consequently, technological barriers are not limited to internal system complexity but also include broader competition within the technology landscape and the relative prioritization of technologies within audit firms.

4.2. Organizational Barriers

Organizational barriers represent a second major dimension influencing blockchain adoption in auditing practice. A central finding in this category is the persistent gap between conceptual recognition of blockchain and its actual operational implementation. Although blockchain is

frequently discussed in professional and strategic contexts, its practical integration into audit workflows remains minimal.

This discrepancy is evident across nearly all interviews, where respondents repeatedly distinguished between theoretical awareness and practical application. In most cases, blockchain is acknowledged as an emerging topic but not actively used in daily audit procedures.

One respondent described this situation as follows: “Blockchain plays virtually no role in my daily work as an audit tool.” (Respondent 4)

This pattern highlights a structural disconnection between innovation discourse and operational reality. Even within Big Four firms, where technological innovation is typically more advanced, blockchain remains largely confined to pilot initiatives or specialized advisory services rather than mainstream audit engagements.

A particularly important organizational factor is the limited exposure of auditors to blockchain based client environments. Most respondents indicated that their audit portfolios rarely include entities actively using blockchain systems or holding significant crypto assets. This lack of client demand directly reduces opportunities for practical engagement with blockchain tools and reinforces the perception of limited relevance.

At the same time, some respondents acknowledged that internal innovation projects do exist within their organizations. However, these initiatives are generally exploratory in nature and do not yet translate into standardized audit methodologies. As a result, blockchain remains structurally peripheral within audit organizations.

Another key organizational barrier is the insufficient integration of blockchain knowledge into internal training systems. Respondents emphasized that existing training programs are primarily designed around traditional audit competencies, with limited emphasis on distributed ledger technologies, smart contracts, or digital asset verification. This creates a knowledge gap that further reinforces the distance between theoretical familiarity and practical capability.

The following statement reflects this issue: “For many auditors, blockchain remains completely new and incomprehensible.” (Respondent 6)

Most respondents also emphasized the lack of practical knowledge and blockchain related competencies among auditors. Interviewees repeatedly noted that traditional auditor training does not provide a sufficient level of technical expertise, even or working with digital assets.

Taken together, these findings suggest that organizational barriers are not merely administrative constraints but structural characteristics of the audit profession itself. They reflect deeply embedded operational routines, risk management frameworks, and institutionalized audit methodologies that shape how innovation is absorbed and implemented.

4.3. Economic and Market Barriers

Economic and market related constraints constitute another important layer influencing the limited diffusion of blockchain technology in Austrian auditing practice. The empirical findings suggest that, beyond technical and organizational considerations, the adoption of blockchain is strongly shaped by perceived economic justification, cost benefit expectations, and the structure of client demand within the Austrian market.

A recurring theme across interviews is the absence of clearly identifiable economic incentives that would justify large scale investment in blockchain infrastructure. Respondents consistently indicated that, in its current stage of development, blockchain does not generate sufficient tangible benefits within standard audit engagements to offset the required implementation costs. These costs include system integration, staff training, technological adaptation, and ongoing maintenance of blockchain compatible audit tools.

This perception significantly affects strategic decision making within audit firms, where resource allocation tends to prioritize technologies with immediate and demonstrable efficiency gains. As a result, blockchain is often evaluated as a long-term exploratory investment rather than a short-term operational priority.

One respondent explicitly summarized this position: “Furthermore, there is often a lack of undeniable economic advantages, and this discourages companies from investing in this technology.” (Respondent 1)

In addition to internal cost considerations, external market demand plays a decisive role. The findings clearly indicate that Austrian clients have not yet developed substantial demand for blockchain based auditing services. In most cases, companies either do not use blockchain systems at all or do so at a very limited scale, primarily in experimental or niche contexts. This lack of demand significantly reduces the commercial pressure on audit firms to develop specialized blockchain auditing capabilities. Without client driven requirements, blockchain remains outside the core value proposition of audit services, which further reinforces its peripheral status.

Another relevant aspect concerns the perceived economic relevance of blockchain within the Austrian business environment. Respondents repeatedly emphasized that blockchain based business models, particularly those related to cryptocurrencies and decentralized finance, remain relatively underdeveloped in Austria compared to other jurisdictions. This limits both exposure and practical relevance for auditors operating in this market.

One interviewee noted: “My clients don't see any benefit from it…” (Respondent 8)

Furthermore, uncertainty regarding return on investment (ROI) emerged as a critical deterrent. Audit firms appear reluctant to commit significant resources to technologies whose long-term financial impact remains ambiguous. This uncertainty is particularly relevant in a highly regulated profession such as auditing, where investments must be justified not only economically but also in terms of compliance, risk management, and reputational considerations.

Overall, the findings suggest that economic and market barriers function as a stabilizing force that preserves existing audit practices. Rather than actively resisting innovation, firms respond to market signals that currently do not support large scale blockchain adoption.

4.4. Human Capital Barriers

Human capital constraints represent one of the most structurally significant barriers identified in this study. The findings demonstrate that the limited adoption of blockchain in auditing is closely connected to gaps in professional competencies, insufficient technical literacy, and the ongoing transformation of the auditor's role in digitally enhanced environments.

Across all interviews, respondents emphasized that blockchain requires a fundamentally different skill set compared to traditional auditing. While conventional audit training focuses on financial reporting, compliance, and analytical review of structured accounting data, blockchain environments demand familiarity with distributed systems, cryptographic principles, data architecture, and IT-based assurance techniques. This mismatch between traditional training and emerging technological requirements creates a competence gap that is consistently reflected in auditor’s self-assessments.

A representative statement highlights this issue: “The biggest challenge is understanding the processes themselves. For the average auditor, blockchain often remains completely new and incomprehensible.” (Respondent 6)

Respondents further noted that most auditors currently engage with blockchain only indirectly, through internal presentations, training sessions, or conceptual discussions rather than hands-on practical application. This reinforces a predominantly theoretical understanding of the technology.

Another important finding is the uneven distribution of blockchain knowledge across professional hierarchies. While junior auditors may occasionally possess more exposure to digital technologies through academic education, senior professionals often rely on established audit frameworks and may require additional upskilling to engage with emerging technologies effectively. This creates a multi layered competency landscape within audit firms.

In addition, the study reveals that blockchain is contributing to a broader transformation of the auditor's professional identity. Several respondents suggested that the role of auditors will gradually shifting from traditional verification of financial statements toward a more technologically embedded function that includes system evaluation, algorithmic assessment, and data infrastructure analysis.

One participant described this evolution as follows: “The role of auditor will shift towards IT consulting. We will become algorithm experts rather than traditional accountant's.” (Respondent 6)

This shift implies a gradual hybridization of the auditing profession, where financial expertise must increasingly be complemented by technological literacy. However, this transformation also introduces uncertainty regarding professional identity, training pathways, and career development structures within audit firms. Overall, human capital barriers are not limited to technical skill shortages but reflect a broader structural transition in the profession, requiring systematic adaptation of education, training, and professional standards.

Taken together, these findings suggest that the human capital dimension represents one of the most important challenges associated with blockchain adoption in auditing. Unlike technological barriers, which may be addressed through investment in infrastructure and software, competency related barriers require long-term development of knowledge, experience, and professional capabilities. The successful integration of blockchain into auditing practice therefore depends not only on technological readiness but also on the ability of the profession to develop the necessary expertise to operate effectively in increasingly digital audit environments.

4.5. Professional Cultural Barriers

The findings reveal that the adoption of blockchain technology in auditing is influenced not only by technological, organizational, and competency related factors, but also by deeply embedded professional and cultural characteristics of the auditing profession. While respondents generally acknowledged the potential benefits of blockchain in terms of transparency and data integrity, their attitudes toward the technology were strongly shaped by professional values, established ways of working, and long-standing assumptions regarding the nature of audit evidence and trust.

A central theme that emerged throughout the interviews concerns the relationship between blockchain and professional scepticism. Auditing has traditionally been built upon the principle that information should not be accepted at face value but must instead be critically evaluated

and independently verified. This mindset remains fundamental to professional practice and strongly influences how auditors perceive new technologies (IAASB, 2022, p. 775).

In this context, respondents repeatedly emphasized that the immutability of blockchain records does not eliminate the need for professional judgement. Although blockchain can make transactions more transparent and resistant to subsequent modification, auditors do not regard these characteristics as sufficient grounds for unconditional trust in the information contained within the system.

One respondent explained this distinction succinctly: „The technology only protects against subsequent changes." (Respondent 3)

A similar concern was expressed by another participant: "If information is entered incorrectly, it is stored unchanged." (Respondent 3)

These statements reflect an important insight that appeared consistently across the interviews. For auditors, the reliability of information depends not only on how data is stored but also on how it is generated.

Consequently, blockchain may improve the integrity of records after they have been entered into the system, but it does not necessarily guarantee the accuracy of the original input. As a result, respondents generally viewed blockchain as a mechanism that changes the nature of verification rather than eliminating the need for verification all together.

This distinction highlights a broader tension between technological trust and professional trust. While blockchain systems are often promoted as technologies that reduce the need for intermediaries and increase confidence in data, auditors continue to approach information from a perspective shaped by professional scepticism. Several interviewees indicated that the notion of fully trusting a technological system is difficult to reconcile with the underlying principles of auditing, which emphasize independent assessment and critical evaluation.

Consequently, respondents often challenged the popular narrative that blockchain creates a "trust less" environment. Instead, they argued that trust is not removed but relocated. Rather than trusting individual transactions or records, auditors must place confidence in the systems,

algorithms, governance structures, and technical controls that underpin the blockchain environment.

One participant articulated this shift particularly clearly: “We're not eliminating trust, but shifting it toward code, system architecture, and the people who develop these systems.” (Respondent 4)

This observation illustrates how blockchain may fundamentally alter the object of audit attention. In traditional audits, verification often focuses on transactions, documents, and financial statements. In blockchain environments, however, auditors may increasingly be required to assess system design, software logic, smart contracts, and technological controls. For some respondents, this development represents a natural evolution of the profession. For others, it introduces a degree of discomfort because it moves auditing further away from its traditional foundations.

Several interviewees also expressed concerns regarding the potential for blockchain to create excessive confidence in automated systems. The advanced technical nature of blockchain can sometimes lead organizations to assume that data stored within the system is inherently reliable. Respondents, however, repeatedly warned against such assumptions and emphasized the continued importance of critical scrutiny.

One respondent described this concern as follows: “Blockchain can also create a false sense of security.” (Respondent 4)

Another significant theme relates to the profession's traditionally cautious attitude toward innovation. Auditing operates within a highly regulated environment where errors can have serious legal, financial and reputational consequences. As a result, new technologies are typically evaluated carefully before being incorporated into standard practice.

Several respondents suggested that this cautious approach should not be interpreted as resistance to innovation. Instead, it reflects the profession's responsibility to ensure that any adopted technology can be understood, explained, and defended within professional and regulatory contexts. Technologies that are perceived as opaque or difficult to interpret naturally encounter greater scrutiny.

This perspective is reflected in the following statement: “Auditors bear a high degree of responsibility and cannot rely on systems they do not fully understand.” (Respondent 3)

The issue of understanding emerged repeatedly throughout the interviews, particularly in discussions surrounding algorithmic systems and smart contracts. Participants frequently indicated that their willingness to rely on technological solutions is closely linked to their ability to understand how those solutions function. Where transparency is limited, scepticism tends to increase.

One respondent explained: “It is difficult to rely on algorithmic systems without fully understanding how they function.” (Respondent 2)

When professionals do not feel sufficiently confident in their understanding of blockchain systems, they will be more likely to rely on established audit approaches and familiar technologies.

This perspective was also reflected in the interviews. One respondent explicitly linked trust in blockchain to the level of understanding of the technology, stating: “My trust is rather limited. Without a clear under-standing, it is difficult to rely on it.” (Respondent 8)

Furthermore, the findings indicate that uncertainty surrounding blockchain knowledge can influence auditors' willingness to engage with the technology. When professionals do not feel sufficiently confident in their understanding of blockchain systems, they are more likely to rely on established audit approaches and familiar technologies. This tendency contributes to the continued dominance of traditional audit methods and slows the adoption of emerging digital solutions. In this sense, competency related barriers not only affect technical capability but also shape attitudes toward innovation and technological change.

The interviews further revealed that many professionals continue to associate blockchain primarily with cryptocurrencies rather than with broader auditing applications. Despite increasing discussion of blockchain's potential role in areas such as supply chain verification, digital identity management, and automated assurance processes, respondents frequently referred to crypto assets as their primary point of reference.

One participant noted: “I primarily associate the topic with cryptocurrencies.” (Respondent 8)

This association may unintentionally narrow perceptions of blockchain's relevance within the auditing profession. When blockchain is viewed primarily through the lens of cryptocurrency markets, its potential applications in other audit related contexts may receive less attention. As a result, the technology can become associated with niche activities rather than broader professional transformation.

The findings also indicate that cultural perceptions are reinforced by the limited visibility of successful implementation cases. Because blockchain remains relatively uncommon within Austrian auditing practice, many professionals have little direct experience with effective real-world applications. This lack of observable success stories contributes to the perception of blockchain as a future possibility rather than an established professional tool.

Taken together, these findings demonstrate that professional cultural barriers constitute a distinct and influential dimension of blockchain adoption. Professional scepticism, caution toward automated systems, concerns regarding trust, and the continued association of blockchain with cryptocurrencies all influence the extent to which the technology is accepted within the profession.

4.6. Institutional and Regulatory Barriers

Across the interviews, respondents consistently emphasized that the successful integration of blockchain into audit processes depends not only on technological feasibility but also on the existence of a clear and supportive regulatory environment. At present, many participants perceive this environment as incomplete, uncertain, and still evolving.

A recurring theme throughout the interviews was the limited integration of blockchain related considerations into existing auditing standards and professional guidance. Although blockchain technologies have received increasing attention from regulators, professional bodies, and standard setters in recent years, respondents frequently noted that practical guidance for auditors remains relatively limited. Consequently, professionals often face uncertainty regarding how blockchain generated information should be evaluated, documented, and incorporated into audit procedures.

One respondent described this challenge as follows: „The technology is not yet sufficiently integrated into existing auditing standards and methods." (Respondent 2)

This observation highlights an important issue for the auditing profession. Auditors operate within a highly regulated environment where professional activities are guided by established standards, methodologies, and quality control requirements. The absence of clear guidance creates uncertainty regarding acceptable audit procedures and may discourage firms from experimenting with new approaches. Even when technological opportunities exist, implementation is often delayed until clearer institutional expectations emerge.

Several interviewees further emphasized that blockchain adoption is complicated by unresolved legal questions surrounding. Respondents frequently referred to smart contracts, digital assets, and decentralized transactions as areas where legal clarity remains limited. Although regulatory developments continue to evolve both within Austria and across the European Union, many participants suggested that important questions regarding legal recognition, liability, and accountability remain unresolved.

One respondent explained: "There are still open regulatory questions, particularly regarding the legal status of smart contracts and the handling of potential systemic errors." (Respondent 2)

A similar concern was raised by another participant: "Insufficient regulatory frameworks for crypto assets and smart contracts." (Respondent 3)

These comments suggest that uncertainty extends beyond auditing itself and reflects broader institutional challenges associated with the governance of emerging digital technologies. From the perspective of audit professionals, legal ambiguity increases risk because organizations may be reluctant to rely on systems whose regulatory status remains unclear. This is particularly relevant in auditing, where compliance with legal and professional requirements is a fundamental aspect of practice.

The findings also indicate that respondents frequently questioned the extent to which blockchain generated information can currently function as a standalone source of audit evidence. While participants generally acknowledged the transparency and immutability of blockchain records, many argued that these characteristics alone are insufficient to replace

traditional verification procedures. Instead, blockchain information is often viewed as a complementary source of evidence that must be assessed alongside other forms of documentation and assurance.

One respondent summarized this position clearly: “Blockchain is not yet recognized as universally valid evidence for audits in Austria and the EU.” (Respondent 7)

This perception has important implications for adoption. If blockchain records are not widely regarded as sufficient audit evidence, auditors have little incentive to fundamentally redesign existing procedures. As a result, blockchain tends to be incorporated into current methodologies incrementally rather than serving as a catalyst for more substantial transformation.

Another important issue that emerged from the interviews concerns professional responsibility and liability. Several respondents noted that blockchain environments introduce new questions regarding accountability when errors occur. Traditional auditing frameworks generally rely on clearly identifiable actors and established governance structures. In decentralized environments, however, responsibility may be distributed across multiple participants, software systems, and technological processes.

This creates uncertainty regarding who should be held accountable in situations involving smart contract failures, software vulnerabilities, coding errors or broader system malfunctions. For auditors such questions are particularly important.

One participant expressed this concern as follows: “Auditors still must test the systems themselves.” (Respondent 7)

The findings further suggest that institutional conservatism contributes to the relatively slow pace of blockchain adoption. Respondents frequently described the auditing profession as one that prioritizes stability, consistency and regulatory compliance. While such characteristics play an important role in maintaining audit quality and public trust, they may also slow the diffusion of innovations that have not yet achieved widespread institutional acceptance.

Importantly, participants did not interpret this conservatism as resistance to technological progress. Rather, they viewed it as a rational response to professional obligations and regulatory

expectations. New technologies must demonstrate not only technical functionality but also compatibility with existing legal frameworks, professional standards, and quality assurance requirements before they can be adopted on a larger scale.

At the same time, institutional conditions do not operate independently from market dynamics. The willingness of audit firms to invest in blockchain capabilities is influenced not only by regulation but also by client demand, competitive pressures, and strategic priorities. These broader market considerations emerged as another important theme within the interviews and are discussed in the following section.

4.7. Market and Strategic Barriers

Participants generally indicated that blockchain was rarely perceived as an urgent priority requiring immediate implementation. Instead, it was commonly viewed as a technology whose practical significance remains dependent on future developments within the market environment.

A recurring theme throughout the interviews was the limited demand for blockchain related services among clients. Respondents frequently noted that blockchain applications remain relatively uncommon within the sectors and organizations they typically audit. As a result, blockchain related issues arise only occasionally in professional practice, reducing the perceived necessity for firms to invest heavily in specialized capabilities or dedicated service offerings.

Several participants emphasized that client demand remains one of the primary drivers of innovation within auditing. Audit firms generally adapt their services in response to emerging business needs, regulatory developments, and market expectations. In the absence of strong demand from clients, blockchain related initiatives often struggle to secure the organizational attention and resources required for broader implementation.

The following comment illustrates this perspective: “My clients don't see any benefit from it.” (Respondent 8)

This statement reflects a broader pattern identified across multiple interviews. Even where respondents recognized the theoretical advantages of blockchain, they frequently observed that many clients perceive little need to transition toward blockchain based solutions. Consequently, the business case for blockchain often remains weak not only from the perspective of audit firms but also from the perspective of the organizations they serve.

Another important finding concerns the perceived maturity of the broader blockchain ecosystem. Several respondents suggested that blockchain adoption within auditing cannot be viewed independently from adoption in the wider economy. Unlike technologies that have already achieved widespread organizational adoption, blockchain is still viewed by many professionals as an emerging innovation whose long-term trajectory remains uncertain. Consequently, firms often adopt a cautious monitoring approach rather than pursuing aggressive implementation strategies. This position allows organizations to remain informed about technological developments while avoiding substantial investments in areas where future demand remains difficult to predict.

The interviews further revealed that strategic decisions regarding blockchain are frequently influenced by opportunity costs. Organizations must continuously decide where to allocate limited financial resources, managerial attention and technological expertise. In this context, blockchain is often evaluated alongside other digital innovations competing for investment. Respondents repeatedly referred to artificial intelligence, advanced analytics, process automation as technologies that currently deliver more immediate and measurable value. Compared with these solutions, blockchain was often perceived as offering less direct impact on day-to-day audit operations.

Importantly, participants did not necessarily interpret this as evidence that blockchain lacks potential. Rather, they viewed it as a question of timing and strategic prioritization. Many organizations appear to believe that other technologies currently provide greater opportunities for efficiency improvements, productivity gains and service innovation.

One respondent explained: “At the moment, technologies such as artificial intelligence are much more relevant to our work than blockchain.” (Respondent 5)

This observation demonstrates how strategic priorities are shaped not only by the intrinsic characteristics of individual technologies but also by their relative position within a broader innovation landscape. Even promising technologies may receive limited attention if alternative solutions are perceived as delivering greater value under current market conditions.

As a result, many firms appear to have adopted a "wait and see" approach. Rather than acting as early adopters, they monitor regulatory developments, observe market trends, and evaluate emerging use cases before making substantial commitments. From a strategic perspective, this approach allows organizations to minimize risk while preserving flexibility in an environment characterized by rapid technological change.

At present, respondents suggested that blockchain has not yet reached this threshold within most audit environments and this technology is often regarded as relevant to specific niche applications, particularly in relation to crypto assets, but less relevant to mainstream auditing activities. Consequently, blockchain continues to occupy a relatively peripheral position within broader digital transformation strategies. In many cases, respondents did not question whether blockchain could be implemented but rather whether it should be prioritized under current conditions.

Overall, the evidence suggests that blockchain remains that blockchain is often viewed not as an immediate driver of audit transformation but as a development that should be monitored carefully as the broader digital environment continues to evolve.

4.8. Interrelationship of Barriers

The Gioia analysis revealed that the barriers identified by respondents are distributed across all three dimensions of the Technology-Organization-Environment (TOE) framework, highlighting the multifaceted nature of blockchain adoption in auditing.

At the technological level, barriers were associated with the complexity of blockchain systems, infrastructure requirements, challenges related to data interpretation, technological immaturity, and competition from alternative digital technologies. These findings suggest that blockchain adoption is constrained not only by technical limitations but also by uncertainty regarding its practical applicability within existing audit processes.

At the organizational level, the findings point to a combination of organizational and human capital challenges. The persistent gap between theoretical discussions and practical implementation, limited blockchain literacy, shortages of specialized expertise, and the ongoing transformation of the auditor's professional role indicate that organizations are still adapting to the knowledge and competency requirements associated with blockchain technologies. The results suggest that organizational readiness depends not only on the availability of technological solutions but also on the ability of audit firms to develop the necessary skills, training structures, and professional capabilities required for effective implementation.

The environmental dimension encompasses a broader set of external influences, including market conditions, institutional factors, and professional culture. Low market penetration, weak external pressure, ecosystem limitations, and insufficient client demand reduce incentives for investment in blockchain related initiatives. At the same time, regulatory uncertainty, concerns regarding return on investment, professional scepticism and the continuing need for independent verification contribute to a cautious approach toward adoption. These findings demonstrate that external conditions shape organizational decision making and influence how blockchain technologies are evaluated within the auditing profession.

Importantly, the findings indicate that these dimensions are closely interconnected. Technological complexity contributes to knowledge gaps among professionals, while limited expertise reinforces organizational caution toward implementation. Similarly, weak market demand reduces incentives to invest in training and infrastructure, whereas regulatory uncertainty further increases perceived risks associated with adoption. As a result, blockchain adoption in auditing emerges not as a challenge driven by a single barrier but as a process shaped by the interaction of technological, organizational, and environmental factors. This interconnected structure helps explain why blockchain remains recognized for its potential benefits while continuing to occupy a relatively limited position in everyday auditing practice.

5. Discussion

The findings of this study provide important insights into the current state of blockchain adoption within the auditing profession in Austria and highlight a clear and persistent gap between theoretical expectations and practical implementation. Existing literature frequently presents blockchain as a technology capable of fundamentally transforming financial auditing through automated transaction verification, greater transparency, and reduced risks of data

manipulation (Dai & Vasarhelyi, 2017, p. 6). In addition, academic research emphasises its potential to improve audit efficiency by enabling immutable records and facilitating real time access to reliable information (Ferri et al., 2020, p. 1077). From a theoretical standpoint, these characteristics collectively frame blockchain as a potentially disruptive innovation capable of fundamentally altering traditional assurance mechanisms.

However, the empirical evidence obtained from 10 semi-structured interviews with auditors, working as in Big Four companies in Austria, reveals a more nuanced and cautious interpretation among practitioners. While auditors generally acknowledge the conceptual advantages of blockchain technology, they consistently emphasise that these benefits remain largely theoretical in the current stage of development. Participants questioned the maturity of blockchain solutions, their relevance for existing audit engagements, and their readiness for integration into established audit infrastructures. Rather than evaluating blockchain solely through its technological promises, practitioners assess it through a multidimensional lens that includes implementation complexity, organisational readiness, regulatory conditions, and market demand. This indicates that the divergence between academic expectations and practical adoption does not stem from a lack of perceived value, but from insufficient structural and institutional readiness for large scale implementation.

This interpretation aligns strongly with the Technology-Organisation-Environment (TOE) framework, which argues that technology adoption is not driven by technological characteristics alone, but by the interaction between technological capabilities, organisational preparedness, and environmental conditions (Tornatzky & Fleischer, 1990, p. 152-154). The interview data clearly demonstrate that blockchain adoption in auditing cannot be understood as an isolated technological decision. Instead, it is embedded within a broader organisational ecosystem in which multiple contextual forces interact simultaneously. These forces not only coexist but also continuously shape and reinforce one another over time.

A key contribution of this study lies in revealing the systemic and interconnected nature of adoption barriers. Rather than functioning as independent obstacles, technological, organisational, and environmental constraints operate as mutually reinforcing mechanisms. For instance, limited market demand for blockchain based audit services reduces the incentive for firms to invest in developing specialised expertise. This lack of investment subsequently contributes to a shortage of blockchain knowledge within audit firms, which in turn limits

organisational readiness and reduces the likelihood of experimentation with blockchain based audit procedures.

The absence of practical experimentation then reinforces perceptions that blockchain remains a niche technology with limited business relevance, thereby further suppressing demand. A similar reinforcing cycle can be observed in relation to regulatory uncertainty. In the absence of clearly defined standards, auditing firms face increased ambiguity regarding compliance requirements, legal risks, and professional responsibilities. This uncertainty encourages a conservative approach to investment in blockchain capabilities. As a result, organisational learning is slowed, opportunities for practical experience are reduced, and knowledge accumulation remains limited. Over time, this lack of experience further reinforces perceptions of risk and uncertainty, creating a self-perpetuating cycle that delays adoption.

At the technological level, existing literature frequently emphasises blockchain's capacity to create secure, transparent, and immutable records (Thies et al., 2023, p. 105). These features are frequently presented as core advantages for auditing because they can improve the reliability of audit evidence and facilitate verification processes. The interview findings partially confirm this theoretical positioning, as participants acknowledged the potential value of these technological characteristics. However, they also emphasised significant implementation related challenges, including interoperability issues, scalability limitations, integration difficulties with legacy systems, and the overall immaturity of blockchain infrastructures.

This suggests that practitioners do not evaluate technology based solely on abstract functionality, but rather on its operational feasibility within real organisational environments. While academic literature tends to emphasise potential benefits in controlled or idealised conditions, practitioners must simultaneously consider risk exposure, cost implications, system compatibility, and implementation complexity. Consequently, technological superiority alone is insufficient to drive adoption unless it is accompanied by demonstrable feasibility and integration capacity within existing audit workflows.

The organisational dimension emerges as a particularly critical factor in explaining adoption outcomes. Consistent with prior research, organisational readiness, leadership support, and employee competencies are identified as central determinants of technology adoption in auditing contexts (Akter et al., 2024, p. 12, 14). The findings of this study strongly reinforce

this perspective by highlighting a persistent shortage of blockchain specific knowledge and practical experience within audit firms. Despite the availability of financial and technological resources in large audit organisations, the evidence suggests that successful transformation depends more fundamentally on human capital development than on capital investment alone. This has important implications for the auditing profession. The integration of blockchain requires auditors to develop competencies that extend beyond traditional accounting and assurance expertise. These include understanding distributed ledger architectures, smart contracts, cybersecurity risks, cryptographic mechanisms, and digital governance frameworks. As these requirements expand, organisational readiness must be reconceptualised not only as technological preparedness but also as the capacity for continuous learning, reskilling, and professional development within audit firms.

Environmental factors further intensify these internal challenges. Regulatory uncertainty remains a dominant constraint, as the absence of established standards creates ambiguity regarding compliance expectations, audit liability, and professional responsibility (Kokina et al., 2017, p. 94). In parallel, limited client demand for blockchain based solutions reduces the commercial justification for investment, weakening the overall business case for adoption. Together, these external conditions create a high uncertainty, low demand environment that discourages firms from committing resources to blockchain initiatives.

In addition, the findings suggest that blockchain competes with other emerging technologies for organisational attention and investment. Participants frequently highlighted artificial intelligence, advanced data analytics, and automation technologies as delivering more immediate and tangible benefits for audit practice. Compared to these technologies, blockchain is often perceived as offering longer-term or less directly observable value, which contributes to its lower prioritisation within organisational innovation strategies. This competitive dynamic further helps explain the slower than expected diffusion of blockchain in auditing practice. The findings also provide important insights into the evolving role of auditors in increasingly digitalised environments. Early conceptualisations of blockchain suggested that distributed ledger technologies could potentially replace traditional auditing functions by providing transparent and tamper resistant records. However, this assumption has been challenged in later research (Schmitz & Leoni, 2019, p. 338), and is not supported by the empirical findings of this study. Instead, participants consistently indicated that blockchain does not eliminate the need for auditing but rather transforms its focus and scope.

As audit environments become more technologically complex, the role of auditors is expected to shift away from transaction level verification toward the evaluation of systems, controls, governance mechanisms, cybersecurity frameworks, and smart contract functionality. In this context, blockchain does not reduce the need for trust; instead, it redistributes the object of trust from financial records to the technological systems that generate and maintain those records. Consequently, auditing becomes increasingly centred on assessing the reliability of digital infrastructures rather than individual transactional data.

Overall, the findings suggest that blockchain adoption in auditing in Austria should be understood as a gradual, evolutionary transformation rather than a disruptive technological revolution. Adoption outcomes emerge from the interaction of technological readiness, organisational capability, and environmental support, all of which evolve over time and continuously influence one another.

5.1. Theoretical Implication

This study makes several contributions to theory, particularly in relation to the TOE framework. First, it demonstrates that adoption determinants are not independent variables, but interconnected components of a dynamic system characterised by feedback loops and reinforcing mechanisms.

Second, the findings extend existing technology adoption literature by highlighting that organisations are more likely to adopt a technology when they perceive clear business benefits from its implementation. Even when technological feasibility exists, adoption may not occur in the absence of clear market demand, economic incentives, and regulatory certainty. This extends the TOE framework by demonstrating that the successful adoption of new technologies depends not only on technological readiness but also on whether organisations perceive a clear business ease and supportive external conditions for implementation.

Third, the findings contribute to the discussion of trust in blockchain enabled auditing. While blockchain is often described as a technology that reduces the need for trust in financial records and transactions, the results of this study suggest that trust is not eliminated but redirected. Instead of focusing primarily on the reliability of accounting records, auditors increasingly need

to evaluate the reliability of the technological environment in which those records are generated and maintained. This includes blockchain platforms, smart contracts, governance mechanisms, and system controls. As a result, professional scepticism remains essential, but its focus shifts from traditional audit evidence towards the assessment of technological systems and processes. This finding provides a more nuanced understanding of the role of trust in blockchain based auditing and highlights the evolving responsibilities of auditors in digital environments.

5.2. Practical Implication

From a practical perspective, the findings suggest that the successful adoption of blockchain in auditing in Austria requires a gradual and comprehensive approach rather than immediate large-scale implementation. The results indicate that one of the most significant barriers is the limited level of blockchain knowledge and practical experience among audit professionals. Consequently, audit firms should prioritise capability development by integrating blockchain related topics into professional training, continuous learning programmes, and internal knowledge sharing initiatives. Increasing auditors understanding of blockchain systems is essential for reducing uncertainty and improving readiness for future technological change.

The findings further highlight the importance of closer collaboration between auditors and technology specialists. As auditing increasingly extends beyond the assessment of financial information towards the evaluation of technological systems and controls, interdisciplinary cooperation between audit professionals, IT specialists, and blockchain experts becomes increasingly important. Such collaboration can facilitate knowledge transfer, improve understanding of blockchain based environments, and support the development of relevant audit procedures and competencies.

Rather than pursuing organisation wide implementation, firms may benefit from adopting blockchain through pilot projects, controlled experimentation, and limited use cases. These initiatives can provide valuable practical experience while allowing organisations to assess technological feasibility, operational compatibility, and potential business value before making substantial investments.

Importantly, the findings suggest that adoption barriers should not be addressed individually. Because technological, organisational, and environmental constraints are closely

interconnected, successful implementation is likely to require a coordinated strategy that simultaneously addresses workforce capabilities, technological infrastructure, regulatory developments, and business incentives, Isolated interventions are unlikely to generate meaningful adoption outcomes if other constraints remain unresolved.

Finally, blockchain should be considered within the broader context of digital transformation. Given the current prominence of artificial intelligence, automation, and advanced data analytics in creating immediate operational benefits, blockchain is unlikely to become a standalone priority for audit firms soon, Instead, organisations should evaluate blockchain as part of a broader portfolio of emerging technologies and align future investments with both strategic objectives and evolving market needs.

5.3. Limitations

Despite the insights generated by this study and the patterns identified throughout the analysis, several limitations should be acknowledged when interpreting the findings.

First, the limitations are closely related to the qualitative research design adopted in this study. The empirical analysis was based on semi-structured interviews with a relatively limited number of respondents, most of whom were employed within large international audit firms. While this approach enabled a deeper understanding of professional perceptions surrounding blockchain technologies and helped uncover more nuanced aspects of technology adoption, the findings cannot be fully generalised to the entire auditing profession in Austria or across other European countries.

An additional limitation concerns the composition of the sample itself. Most participants represented Big Four firms. As a result, the findings primarily reflect perceptions formed within large professional structures and may not fully capture the experiences of smaller audit firms or local auditing practices, which often operate with different levels of financial resources, digital maturity, and organisational flexibility. It should also be recognised that blockchain technologies remain at a relatively early stage of development. Many processes associated with distributed ledger systems, smart contracts, and blockchain-based auditing continue to exist largely within experimental or pilot environments. Consequently, auditors' professional assessments are often formed under conditions characterised by limited practical experience, a

lack of standardised solutions, and considerable uncertainty regarding the future development of the technology.

Another important limitation relates to the institutional specificity of the Austrian context. The findings emerged within a particular regulatory environment, professional culture, and market structure. Therefore, the results may differ from those observed in countries with more advanced blockchain ecosystems, alternative regulatory approaches, or higher levels of crypto-asset adoption and technological integration.

Finally, the dynamic nature of blockchain technology itself should also be considered. Blockchain technologies, smart contracts, and related regulatory frameworks continue to evolve rapidly. As a result, certain findings presented in this study may change over time as digital infrastructures develop further, new professional standards emerge, and practical experience within the auditing profession continues to accumulate.

5.4. Future research directions

The findings of this study suggest several directions for future research. Cross industry assessment across different countries could provide a deeper understanding of how institutional and regulatory environments influence blockchain adoption in auditing. Comparisons between Austria and neighbouring jurisdiction such as Germany may be especially valuable, as they could reveal how different regulatory frameworks and professional contexts shape adoption patterns.

Future research may also benefit from extending the analysis beyond the auditing profession. Including perspectives from regulators, technology providers, corporate managers, and investors would allow for a more comprehensive understanding of the broader blockchain ecosystem and the range of factors that influence implementation decisions. Such multistakeholder approaches could further clarify how adoption is shaped not only within audit firms but also across the wider institutional environment.

In addition, future studies could examine how recent regulatory developments, including the Markets in Crypto Assets Regulation (MiCA), affect auditors' willingness to engage with

blockchain based systems and digital assets. This would help to better understand how evolving regulatory clarity may influence professional practices and risk perceptions over time.

Finally, further research could explore the interaction between blockchain and other emerging technologies such as artificial intelligence, automation, and advanced data analytics. Investigating the combined impact of these technologies may provide valuable insights into the ongoing transformation of auditing and the future configuration of professional assurance services.

6. Conclusion

The aim of this study was to contribute to a deeper understanding of how blockchain is perceived by audit professionals and which factors currently influence its adoption in practice within Big Four firms in Austria. In addition, the study purpose was to assess auditors' readiness to adopt the technology, their attitudes towards it, and the reasons why blockchain remains predominantly a theoretical rather than a practically implemented technology in the Austrian auditing context.

The findings indicate a clear gap between theoretical expectations and practical realities. While academic literature frequently presents blockchain as a transformative innovation with the potential to significantly reshape auditing practices, practitioners describe a considerably more cautious environment in Austria. In this context, a key outcome of the study is not the existence of individual barriers in isolation, but rather their interdependent and reinforcing nature, which collectively explains the limited level of practical implementation within Big Four firms in Austria.

More specifically, the adoption of blockchain is constrained by a combination of technological, organisational, and environmental factors. These include regulatory uncertainty, limited client demand, unclear economic benefits, technological complexity, and a lack of specialised expertise. Rather than operating independently, these barriers interact and reinforce one another, thereby sustaining the slow pace of adoption in the Austrian auditing environment.

Importantly, these findings can also be interpreted through the Technology-Organisation-Environment (TOE) framework, which explains innovation adoption as the outcome of the interaction between technological, organisational, and environmental contexts rather than

isolated determinants. In this regard, the study empirically confirms the relevance of the TOE framework in explaining blockchain adoption dynamics in auditing.

Consequently, the results suggest that overcoming current limitations requires not a fragmented or isolated response, but a comprehensive and systemic approach that simultaneously addresses professional capability development, technological infrastructure, and institutional conditions within the Austrian auditing ecosystem.

From a theoretical perspective, the study contributes to the existing literature in two main ways. First, it provides empirical evidence from the Austrian auditing context, which remains relatively underexplored in blockchain adoption research. Second, it refines the understanding of technology adoption processes by demonstrating that positive perceptions of blockchain do not necessarily translate into implementation decisions. This further supports the existence of a blockchain adoption paradox, whereby auditors acknowledge the value of the technology but simultaneously perceive insufficient incentives and conditions for its widespread use.

Overall, the study concludes that blockchain should not be viewed as an immediate substitute for existing auditing practices in Austria, Instead, it represents a long-term transformational technology whose adoption will progress gradually, depending on the parallel development of organisational readiness, regulatory clarity, technological maturity, and professional expertise within the Austrian auditing environment.

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Appendix

Interview guide

1. General Information

1.1. Your professional experience (in years):

1.2. Your current professional role:

2. Experience and Knowledge

2.1. Have you encountered any tools or solutions related to blockchain technologies within the auditing practice of your organization? If yes, in what context?

2.2. What is your overall perception of blockchain technologies? How are blockchain-based solutions perceived within your organization? In your view, how could such tools (or potential tools) support auditing or accounting processes?

2.3. Would you recommend the implementation of such tools? Do you see potential for the use of blockchain technologies in the future? Why or why not?

2.4. In your opinion, how could the use of blockchain technologies affect the traceability of transactions compared to traditional accounting systems? Do you perceive this as an advantage or as an additional source of complexity?

2.5. Do you believe that blockchain technologies will influence how auditing and accounting firms operate in the future? Please explain your reasoning.

2.6. Based on your experience or expectations, do you think that tracking and analysing transactions in a blockchain environment could be challenging for auditors? Please elaborate.

2.7. In your view, could the availability of data stored on a blockchain enhance the reliability of audit evidence and potentially influence audit procedures?

2.8. To what extent do you trust data recorded on a blockchain in terms of its immutability and resistance to fraud?

2.9. How do you think errors or transactions corrections would be handled in a blockchain environment and could this pose challenges for auditing?

2.10. What technical and organizational barriers, in your opinion, hinder Austrian companies from adopting and developing blockchain technologies in auditing? Additionally, how should auditors deal with large volumes of data generated by blockchain systems?

Thank you very much for your participation! Your responses are valuable for advancing research in the field of blockchain technologies in auditing.

Gioia (2021) Method: Systematic Analysis of Interviews

3rd- ORDER AGGREGATE DIMENSIONS according TOE framework	2nd-ORDER THEMES	1st-ORDER CODES	RELEVANT VERBATIM (QUOTES)	INTERVIEW NUMBER (Respondents)
Technological (T) Context	T1. Technological Barriers	Complexity of Blockchain System	*„Analysing blockchain data is often challenging, primarily due to its technical structure. Untike traditional accounting systems, the data is not always available in a structured format familiar to auditors. “*	**R1**
			„ ...complex, especially for auditors without a technical background... „	**R2**
			"Large volumes of data and the question of how to interpret them meaningfully are paramount. Simply viewing transactions is insufficient.... “	**R5**
			“...data volumes are large, and the structure is unfamiliar. Without technical understanding, you quickly reach your limits. I personally would definitely need to get support… since errors persist; you can't simply delete them. Corrections are made via new entries. I imagine that would be quite time-consuming for the audit...”	**R9**
			“Errors are therefore not corrected by changes, but rather by additional corrective transactions. “	**R1**
		Infrastructure Burden	*“Bitcoin, for example, is criticized for its high energy consumption. I don't believe the situation is much better for blockchain in general, as the amount of data will continue to grow. “*	**R10**
			“...the main challenges are high infrastructure requirements, integration efforts with existing systems... “	**R2**
		Data Structure and interpretation	*“...errors... they can't simply be fixed-they remain in the system; only adjustments can be made. From an auditing perspective, this presents more of a complication...” “...enormous amounts of information need to be analysed and understood. And the fundamental question remains: How can all of this be scaled, where should the data be stored, and how should it be processed...”*	**R10**
			“Handling corrections seems rather complicated... “	**R8**
		Strategic Competition of Technologies	*“...we are now focusing primarily on artificial intelligence...”*	**R6**
			“...artificial intelligence, for example, currently has a significantly greater impact on everyday work than blockchain...”	**R3**
			“For Austria, two key points stand out: the crypto industry plays a rather minor role economically...”	**R5**
			“...Companies are currently investing more in technologies that are quicker to integrate, easier to understand, and immediately applicable...”	**R7**
			“The influence of other technologies, such as Al, is currently much more noticeable.”	**R5**

		Technological Immaturity	*"...there are still not fully developed, universally applicable, and universally usable solutions for blockchain-based accounting systems..."*	**R1**
			"...we see that the solutions aren't mature yet..."	**R3**
			"...the data is not always directly interpretable and requires additional technical knowledge and suitable analytical tools..."	**R1**
Organizational (O) Context	**T2. Organisational Barriers**	**Theory-practice Gap**	*"...practical implementation is still lacking..."*	**R5**
			"...believe many teams lack practical experience and insufficient access to clients who are using blockchain..."	**R7**
			"...difficult adaptation and integration into daily routines as one of the main reasons why this is developing rather slowly..."	**R9**
			"Right now, it's more theory than practical experience..."	**R10**
			"...blockchain plays virtually no role in my daily..."	**R4**
			"...My experience in this area is more theoretical..."	**R2**
			"... the lack of practical experience, specific knowledge, and understanding of this technology..."	**R1**
	T3. Human Capital Barriers	**Lack of Blockchain Literacy**	*"The biggest challenge is understanding the processes themselves. For the average auditor, blockchain often remains completely new and incomprehensible..."*	**R6**
			"...blockchain significantly improves traceability... this does not automatically simplify matters for the auditor, as the data can be technically complex and require a deeper understanding of the blockchain structure..."	**R7**
			"...my understanding is rather basic. I primarily associate the topic with cryptocurrencies, but I lack a concrete connection to auditing…many lack even a basic understanding of the technology"	**R8**
			"...the technology isn't quite mature yet...."	**R9**
		Profession Transformation/ Hybridization	*"...auditors need to expand their traditional role ...this is no longer just auditing; it's partly IT auditing and systems analysis."*	**R4**
			"..., blockchain requires entirely different skills for data verification...impact will be enormous. The role of the auditor will shift towards IT consulting. We will become algorithm experts rather than traditional accountants..."	**R6**
			"...more technical understanding. Probably more IT people on the team and generally more training..."	**R9**
			"...the role of the auditor itself will likely become more IT-oriented..."	**R10**
			"...This task falls within the scope of IT auditing..."	**R1**

		Talent Shortage	*"...for actual widespread application, additional tools and training would be necessary...the main barriers are a lack of experience and knowledge..."*	**R7**
			"...not everyone has this knowledge. Young professionals may have basic theoretical knowledge from their studies, but more experienced auditors often need additional training...such topics need more attention at the university level as well."	**R10**
			"...additional training requirements, and adjustments to existing audit processes..., It is difficult to rely on algorithmic systems without fully understanding how they function..."	**R2**
	T4. Economic Barriers	**Unclear ROI**	*"...implementation involves considerable costs, while client demand remains limited..."*	**R3**
			"I wouldn't actively push for its introduction at this time. Not because the technology is bad, but because it's not yet integrated into the economic logic of auditing. Auditing also means efficiency - time, budget, client expectations..."	**R4**
			"...there is often a lack of undeniable economic advantages, and this discourages companies from investing in this technology..."	**R1**
		Unclear Value Added	*"...low awareness of the technology's concrete benefits..."*	**R3**
			"My clients don't see any benefit from it..."	**R8**
			"...many don't see any concrete added value in their daily work - and fragmented knowledge - there are specialists, but not a broad understanding..."	**R4**
Environmental (E) Context	**T5. Market And Strategic Barriers**	**Low Market Penetration**	*"...the technology is not yet sufficiently integrated into existing auditing standards and methods..."*	**R2**
		Weak External Pressure	*"As long as our clients do not adopt this technology across the board, there is no urgent need for us to restructure our processes..."*	**R6**
		Ecosystem Weakness	*"It's not relevant to our market right now. It may be further along in other countries, but there's no noticeable need here..."*	**R8**
			"The main reason is the lack of relevance. Cryptocurrencies have little economic significance in Austria, unlike in some other countries..."	**R8**
			"...in Austria, the field is developing cautiously, which is understandable given the current market situation..."	**R5**
		Lack of Demand	*"...promising, but rather niche area..."*	**R2**
			"...actual implementation will depend heavily on demand and regulatory developments..."	**R3**
			"...limited client demand..."	**R2**

			"...digitization and the switch to smart contracts require massive investments in IT infrastructure and personnel, which is not feasible for every company. ***As long as our clients do not adopt this technology across the board****, there is no urgent need for us to restructure our processes..."*	**R6**
	T6. Institutional And Regulatory Barriers	**Regulatory Uncertainty**	*"...open regulatory questions, particularly regarding the legal status of smart contracts and the handling of potential systemic errors..."*	**R2**
			"...Insufficient regulatory frameworks for crypto assets and smart contracts..."	**R3**
			"...blockchain is not yet recognized as universally valid evidence for audits in Austria..."	**R7**
	T7. Professional-Cultural Barriers	**Professional Scepticism**	*"My attitude toward blockchain technologies… with a certain degree of professional scepticism… such data must be scrutinized just as critically as other sources of information..."*	**R2**
			"...blockchain doesn't solve the problems of auditing..."	**R4**
		Requirement for Verification	*"...verifying the data and systems remains necessary..."*	**R3**
			"...auditors cannot simply assume that data is correct just because it is stored on a blockchain. The integrity and functionality of the system must first be validated as part of an IT audit..."	**R1**
		System Distrust	*"...we're not eliminating trust, but shifting it toward code, system architecture, and the people who develop these systems..."*	**R4**
			"...my trust is rather limited. Without a clear understanding, it is difficult to rely on it..."	**R8**
			"Fraud can occur even before storage…trust is shifting: less focus on the data itself, more on the processes behind it..."	**R4**
			"Risks remain-access, keys, human error..."	**R10**
			"...risks are emerging- for example, cyberattacks, unauthorized access to wallets or private keys. Data privacy is another issue..."	**R9**
			"...Theoretically, blockchain can increase the reliability of data because it cannot be altered retroactively. However, this does not mean that the data is automatically correct. If information is entered incorrectly, it is stored unchanged...I wouldn't speak of unconditional trust. The technology only protects against subsequent changes..."	**R3**