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Blockchain Adoption and Its Influence on the Qualitative Characteristics of Useful Financial Information

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ABSTRACT

Objective: this study proposes a theoretical model to examine the effects of blockchain adoption and use on the qualitative characteristics of useful financial information (QCUFI). Based on this model, the study illustrates the perceived effects of blockchain on QCUFI through a real-world application in a financial institution in Brazil. **Methods:** this is a qualitative, exploratory study conducted in two stages. First, a documentary analysis was performed to develop the theoretical model. Second, a case study was conducted to refine and illustrate the model in practice. **Results:** the study identifies that each blockchain characteristic is associated with at least two QCUFI. Among them, decentralization and transparency are the most relevant, as they establish relationships with all QCUFI. The proposed model provides a valuable reference for academics and practitioners, facilitating the translation of blockchain applications into accounting studies and business decisions. **Conclusions:** this study addresses gaps in the literature by proposing a standardized approach to analyzing blockchain's effects in the accounting context. It contributes to bridging the knowledge gap between blockchain technology developers, accounting professionals, and academics.

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INTRODUCTION

The rapid pace of technological development has been transforming people's lives, directly affecting how individuals interact, consume, live, and work (Bessant & Tidd, 2020). This dynamic has also posed challenges to traditional accounting practices, with blockchain emerging as a strong contender for driving organizational transformation, particularly in enhancing the quality of accounting processes (Al Shanti & Elessa, 2022; Hisrich & Soltanifar, 2021). The direct relationship between blockchain and accounting is evident in the accounting information product, as the attributes of blockchain technology directly influence the handling and quality of shared information (Fang et al., 2023; Giang & Tam, 2023; Oliveira, 2024; Oliveira et al., 2022).

Accounting is a science whose primary objective is to credibly translate economic and financial phenomena into numerical data (Barth, 2014; Bauer et al., 2014). This process enables the generation of information that supports stakeholders, particularly decision-makers (Rahman et al., 2024). It is essential that the information produced by accounting be grounded in a robust conceptual framework in order to clearly define the quality standards necessary for such information to be useful (International Accounting Standards Board [IASB], 2018; Mala & Chand, 2015). Due to the decentralization made possible by technology, the need to maintain records across multiple databases is eliminated, resulting in time savings and a significant reduction in the risk of human error (Alkafaji et al., 2023; Kokina et al., 2017). These new methods of recording, processing, and storing information have the potential to produce significant impacts on the accounting field, positioning blockchain technology as a valuable tool for enhancing accounting practices (Al Shanti & Elessa, 2022; Schmitz & Leoni, 2019; Yu et al., 2018).

By adopting an ecosystem perspective on the use of blockchain in accounting, trust among the agents involved in transactions — who are often independent and lack inherent trust in one another — becomes achievable through blockchain's transparency and decentralization. These characteristics enable the immutability and integrity of shared information (Cai, 2019; Centobelli et al., 2021; Karajovic et al., 2019; Liu et al., 2019; Maffei et al., 2021). Alongside these features, programmability, enabled through smart contracts within blockchain applications, facilitates significant improvements and transformations in information systems and accounting practices (Alsaqa et al., 2020; Appelbaum & Nehmer, 2020; Cappiello & Carullo, 2021; Church et al., 2021; Dyball & Seethamraju, 2021; O'Leary, 2019; Tan & Low, 2019; Zhang et al., 2020; Zhou et al., 2022).

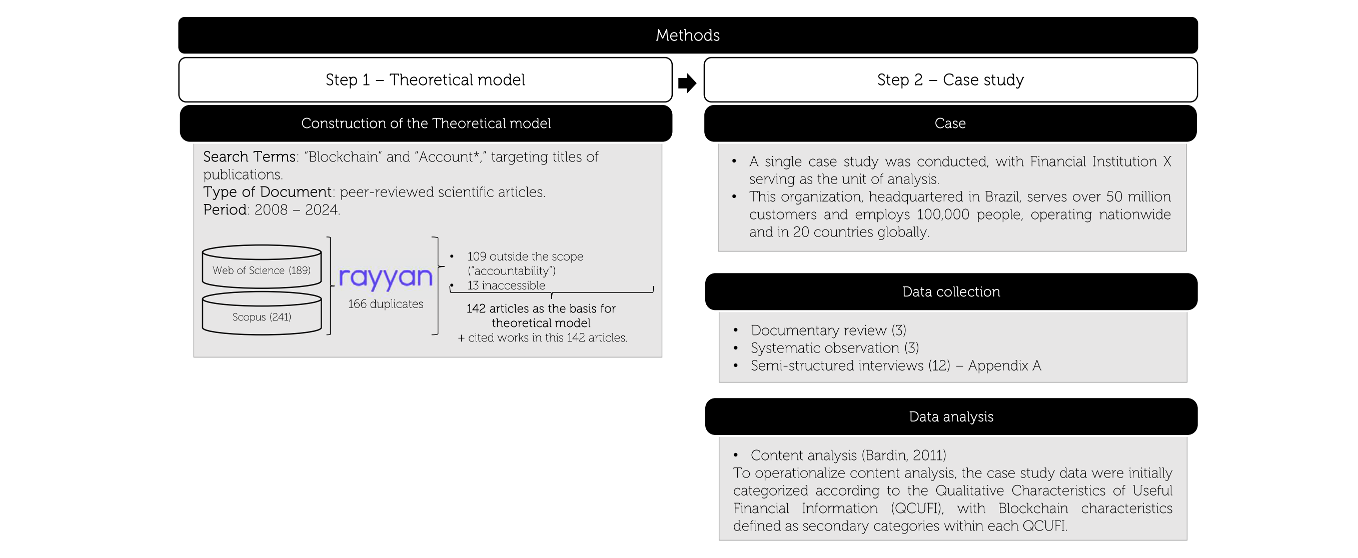
Despite these advancements, there is a scarcity of studies establishing standards as a foundation for analyzing blockchain's effects in the accounting domain, as well as a knowledge gap between technology developers and accounting professionals (Centobelli et al., 2021). Specifically regarding blockchain's direct relationship with information, few studies have explored its influence on accounting information (Al Shanti & Elessa, 2022). In line with the need to clearly define quality standards to ensure the usefulness of information conveyed through accounting (IASB, 2018; Mala & Chand, 2015), this study contributes by expanding the traditionally established boundaries concerning the pursuit of improving informational usefulness through the use of emerging technologies, particularly blockchain technology.

Since information is a cornerstone of accounting and blockchain has the potential to revolutionize its transaction processes (Institute of Chartered Accountants in England and Wales [ICAEW], 2018), this article aims to define a theoretical model to examine the effects emerging from blockchain adoption on the qualitative characteristics of useful financial information (QCUFI). Furthermore, the article seeks to illustrate the perceived effects of blockchain on QCUFI through a real-world application conducted in a financial institution that developed a solution to improve information exchange with its clients.

Although blockchain is establishing itself as a disruptive force in information sharing across sectors such as agriculture and finance (Smith & Castonguay, 2020), research analyzing its adoption and use in accounting remains limited (Chod et al., 2020; Han et al., 2022). Blockchain facilitates new methods of data manipulation, enabling the processing of larger volumes of information in shorter timeframes and automating accounting tasks. Consequently, theoretical and practical studies linking the characteristics of this technology to the quality of accounting and financial disclosures are both necessary and relevant (Centobelli et al., 2021; Deloitte, 2016; Kwilinski, 2019).

METHODS

This study is structured as qualitative research and adopts an exploratory perspective concerning its objectives. The article is divided into two stages (Figure 1).



Source: Developed by the authors.
Figure 1. Methods.

Step 1 — Theoretical model

A documentary review was conducted, focusing on scientific articles selected from academic databases. Scopus and Web of Science were chosen due to their relevance in the field (Wanyama et al., 2021). The search period spanned from 2008 — the year blockchain technology emerged — through 2024.

The search terms used were 'blockchain' and 'account*,' targeting titles of publications. Only peer-reviewed scientific articles were included, resulting in a total of 430 articles, 189 sourced from Web of Science and 241 from Scopus, which were imported into the Rayyan tool. The software identified 166 duplicates, reducing the sample to 264 articles.

The abstracts of these 264 articles were reviewed, leading to the exclusion of 109 articles as they fell outside the scope of this research, the majority of which were related to the term 'accountability.' Examples include: "Secure Data Access Control with Fair Accountability in Smart Grid Data Sharing: An Edge Blockchain Approach" and "Blockchain-Based Smart Advertising Network with Privacy-Preserving Accountability."

Additionally, 13 publications were inaccessible, leaving a final sample of 142 articles as the basis for the theoretical model. To enrich and further qualify the information base, cited works within these 142 articles were also considered, aligning with the exploratory nature of this research aimed at developing new concepts (Marconi & Lakatos, 2010).

For data analysis, interpretative techniques were employed to examine the collected data and model possible relationships between blockchain technology and QCUFI. Content analysis was also applied to delve into the grammatical, cognitive, and ideological characteristics of the data, supporting the findings and inferences presented (Bardin, 2011).

In relation to the data analysis procedures, it is important to highlight that the 73 articles from 2023 and 2024 were incorporated into a post hoc review phase of the analytical process, since their collection occurred after the theoretical model had been constructed and the case study executed. This review revealed no need for adjustments to the previously established theoretical framework, thus confirming its consistency. Accordingly, the articles served exclusively as confirmatory theoretical support, reinforcing the robustness of the prior analyses.

Step 2 — case study

The case study approach allows for a deeper understanding of a given situation by gathering detailed information, enabling robust inferences and contributing to the conceptual development of the subject (Yin, 2015). A single case study was conducted, with Financial Institution X serving as the unit of analysis. To preserve confidentiality, the institution's name has been anonymized. This organization, headquartered in Brazil, serves over 50 million customers and employs 100,000 people, operating nationwide and in 20 countries globally.

To conduct this case study, ethical procedures included initiating a formal authorization process with the financial institution, in which all stages of the theoretical framework of the research were detailed, including data collection methods, processing procedures, and dissemination plans. In addition, the authors provided participants with a free and informed consent form outlining the anonymous use of data exclusively for the purposes of this study. Finally, preliminary results were presented to the financial institution to ensure an opportunity for review regarding the confidentiality of any information that might inadvertently disclose the identity of the participating entity.

Data collection methods included documentary review, systematic observation, and semi-structured interviews, ensuring greater robustness through triangulation (Flick, 2009). The documentary review encompassed internal and external documents (Marconi & Lakatos, 2010), including institutional materials, documents provided by interviewees, internal portals, and external sources like the institution's website. After pre-analyzing these documents, three were selected for analysis, identified as 'document + identification number' (Table 1).

Table 1. Documents collected.

Document	Content Summary	Format	Number of Pages/Slides
Document 1	Project Scope: objectives, deliverables, activities, schedule and resources required	Digital document (PDF)	9
Document 2	Power document: public power of attorney	Physical (paper)	4
Document 3	Presentation to internal areas, customers and future partners	Slide Show (ppt)	18

Note. Developed by the authors.

Systematic and participant observation involved the analysis of practices and internal data disclosed during interviews and participants' routines. During the observation sessions, notes were taken, and screen photos or videos were captured — whenever possible — to document the observed processes. Three observation instances were selected for analysis, each identified in this study as 'observation + identification number' (Table 2).

Table 2. Observations made

Observation	Observed Process	Observation Duration
Observation 1	Complete process of granting powers executed in the traditional way, without the developed Blockchain solution.	The process was followed from start to conclusion, for 8 days.
Observation 2	Complete process of granting powers executed through the developed Blockchain solution	One working day (8 hours).
Observation 3	Customer demand regarding a power that has expired without his knowledge in the institution's system.	One working day (8 hours).

Note. Developed by the authors.

Semi-structured interviews followed a script (Appendix A) developed based on the theoretical model, which underwent face and content validation by two professors with PhDs in information systems management. All employees of Financial Institution X involved in the solution's development and use were invited to participate, in total of 19 invitations, with 12 positive responses. The interviews were conducted online via Microsoft Teams in late 2023, with participants' consent for recording and transcription. To ensure confidentiality, interviewees were anonymized as 'interviewee + identification number.' Table 3 provides the profiles of the interviewees.

Table 3. Profile of the interviewees.

Interviewee	Age	Education	Current Position	Length of time in the company (years)	Experience with Blockchain (years)
Interviewee 1	37	Specialization in Finance and Bankign	Advisor	14	5
Interviewee 2	43	Specialization in Technology for Business	Manager	14	5
Interviewee 3	34	Specialization in Artificial Intelligence	Specialist	15	4
Interviewee 4	54	Specialization in Quality Management in Services	Advisor	23	3
Interviewee 5	59	Specialization in Data Processing	Advisor	14	3
Interviewee 6	45	Specialization in Business Management	Advisor	25	4
Interviewee 7	41	MBA Digital Business	Director	19	6
Interviewee 8	38	Specialization in Business Management	Advisor	12	3
Interviewee 9	38	Specialization in People Management	Advisor	10	3
Interviewee 10	45	MBA Cloud Engineering and Architecture Solutions	Manager	14	4
Interviewee 11	43	Specialization in Software Engineering	Executive Manager	22	6
Interviewee 12	42	Executive MBA in Financial Business	Executive Manager	22	4

Note. Developed by the authors.

Data from observations, document reviews, and interviews were transcribed and organized for import into NVivo 14 software. For data analysis, content analysis was applied (Bardin, 2011), guided by theory to illustrate the relationships identified in the theoretical model (theory-driven). Initial categories included all constructs and their interrelations presented in the theoretical model (Appendix B). To operationalize content analysis, the case study data were initially categorized according to the qualitative characteristics of useful financial information (QCUFI), with blockchain characteristics defined as secondary categories within each QCUFI.

THEORETICAL MODEL

The characteristics of blockchain are considered to be 'immutability,' 'decentralization,' 'transparency,' and 'programmability' (Tapscott & Tapscott, 2016; Treiblmaier, 2019). In the QCUFI, those formally presented by the International Accounting Standards Board (IASB), which defined as fundamental 'relevance' and 'faithful' representation, and improvement to 'comparability,' 'verifiability,' 'timeliness,' and 'understandability' (IASB, 2018). The ideas represented by them complement each other, making blockchain a technology that enables convergent and desirable attributes for QCUFI, if the improvement of the process of dissemination and exchange of information is considered (McComb & Smalt, 2018), and which offers alternatives even superior to those known and used in traditional practices in the accounting field (Coyne & McMickle, 2017; Kokina et al., 2017; McComb & Smalt, 2018).

Blockchain characteristics

Blockchain, originated in 2008 (Nakamoto, 2008), presents itself as an effective solution to the problem of lack of trust in online transactions (Tapscott & Tapscott, 2016). The technology proposes a distributed ledger in which each recorded entry is shared and encrypted, being easily viewed and verified by any participant in the network (Kokina et al., 2017). Each new 'page' of this ledger carries information from the previous page, thus forming a chain of blocks. These blocks are encrypted, chained, and interdependent, such that any attempt at fraud would require reprocessing all previously recorded pages (or blocks) before a new block could be added (Schmitz & Leoni, 2019).

Regarding the operation of blockchain, few authors formally delimit its defining characteristics, with notable exceptions being Tapscott and Tapscott (2016) and Treiblmaier (2019). Treiblmaier (2019) defines these characteristics as 'immutability,' 'transparency,' 'programmability,' 'decentralization,' 'consensus,' and 'distributed trust.' Tapscott and Tapscott (2016), on the other hand, underline principles such as 'network integrity' (or simply 'integrity'), 'distributed power,' 'value as incentive,' 'security,' 'privacy,' 'preserved rights,' and 'inclusion.'

Regarding immutability, Treiblmaier (2019) notes that it is often considered one of the main characteristics of blockchain, as it underpins several other important properties of the technology. With the guarantee of immutability, users can be assured that the information recorded on the network will remain unaltered, with no possibility of tampering, thus fostering values such as 'integrity' and 'security.' Tapscott and Tapscott (2016) emphasize that these values permeate the entire blockchain execution process, encouraging honest, responsible, and mutually beneficial practices among users of the technology, given the way its structure was designed.

'Transparency' is perhaps the characteristic most affected by the type of blockchain model employed. In a public blockchain, full transparency is ensured, meaning that all users can view and add information to the network, thereby providing traceability to any interested party (Helliar et al., 2020). In a private blockchain, only authorized users have access to full transparency, which does not prevent traceability from being ensured when necessary. Regardless, transparency remains one of the fundamental pillars of the technology and enables adjustments to factors such as privacy, for instance (Treiblmaier, 2019).

With regard to privacy, Tapscott and Tapscott (2016) also highlight, in addition to privacy itself, the principle of preserved rights. In this context, it is worth noting that trust, as discussed by Treiblmaier (2019), emerges from features such as immutability, decentralization, and transparency, which enable transactions to occur without requiring mutual trust among participants. As a result, there is no need to share any data beyond what is strictly necessary for the execution of the transaction, thus ensuring both 'privacy' and the 'preservation of rights.'

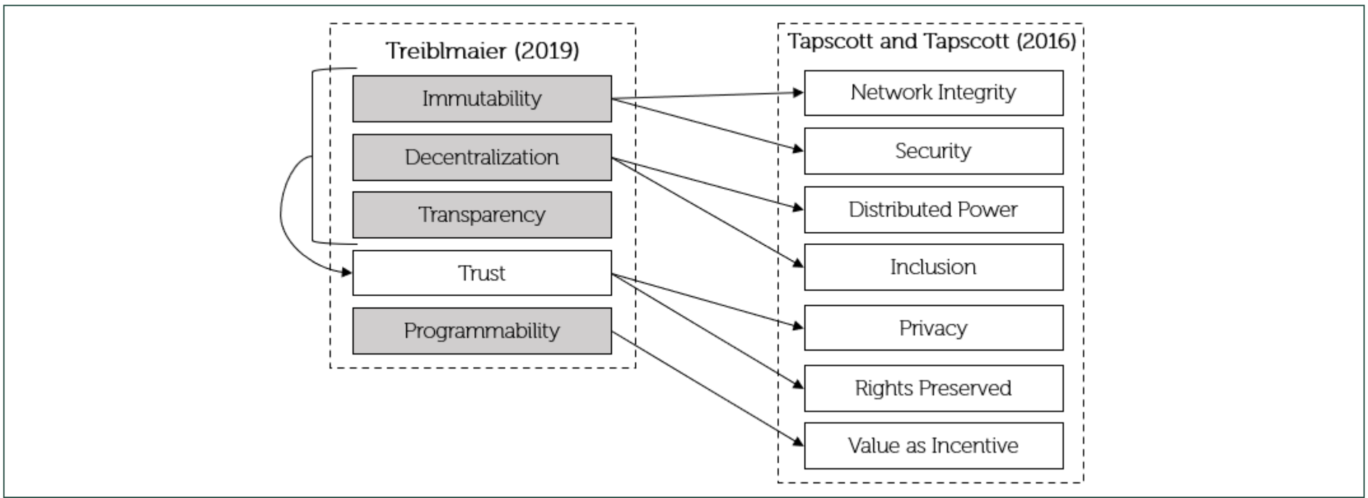
Among all blockchain characteristics, 'decentralization' — or 'distributed power' — may be considered one of its most significant strengths. The architecture of the technology allows for the secure exchange of information without the need for intermediaries, thanks to the combined structure of technologies introduced by Nakamoto (2008). Due to its distributed nature, no central authority is required to validate transactions, which enhances governance practices and fosters more efficient and effective organizational structures, while also reducing transaction costs (McCallig et al., 2019; Smith & Castonguay, 2020).

Moreover, it is not uncommon for large centralized powers to override individual will, manipulating and exploiting users' data without their consent. Another possibility enabled by decentralization is social inclusion. Since decentralized networks (e.g., payment systems) lack centralized interests, the exclusion of certain social groups due to a lack of financial return becomes less significant; after all, no single entity benefits individually from the structure of decentralized systems enabled by blockchain technology (Tapscott & Tapscott, 2016; Treiblmaier, 2019).

Finally, considering the properties addressed in the two aforementioned works, it is also worth commenting on 'programmability' and 'value as an incentive.' Treiblmaier (2019) defines 'programmability' as the possibility of implementing smart contracts — computer programs that establish a means by which tasks can be automated, leading to the fulfillment of certain obligations as prerequisites are met (Gans, 2019). This idea was first proposed by Szabo (1997) as a solution for mediating economic transactions, avoiding the need for third parties and preserving the privacy of the transacting parties — even if only theoretically — since, at the time, the technological infrastructure necessary to support contracts functioning without a trusted intermediary had not yet been developed.

This concept reinforces the idea of 'integrity,' as participants in a transaction can be certain that it will take place if the pre-established conditions are met. Tapscott and Tapscott (2016) observe that it is through 'programmability' that the Bitcoin network aligns the incentives of all its participants. Nakamoto (2008) programmed the system so that users have 'value as an incentive' to act honestly, while those who attempt to engage in fraudulent behavior are penalized.

Following the analysis of the works by Treiblmaier (2019) and Tapscott and Tapscott (2016), clear intersections between their ideas can be identified, such as 'immutability' with 'integrity' and 'security'; 'decentralization' with 'distributed power' and 'inclusion'; 'trust' with 'privacy' and 'preserved rights'; and 'programmability' with 'value as an incentive.' Based on these relationships, and in pursuit of a definition of blockchain's core characteristics, the adopted criterion was to consider only the fundamental characteristics — that is, those that give rise to others — rather than constructs that emerge from specific combinations of such foundational features. These constructs and relationships are better illustrated in Figure 2, which highlights in gray the four blockchain characteristics that will be considered in the theoretical model under discussion: 'immutability,' 'decentralization,' 'transparency,' and 'programmability.'



Source: Developed by the authors based on Treiblmaier, H. (2019). Toward more rigorous blockchain research: Recommendations for writing blockchain case studies. Frontiers in Blockchain, 2. and Tapscott, D., & Tapscott, A. (2016). Blockchain revolution. SENAI-SP.

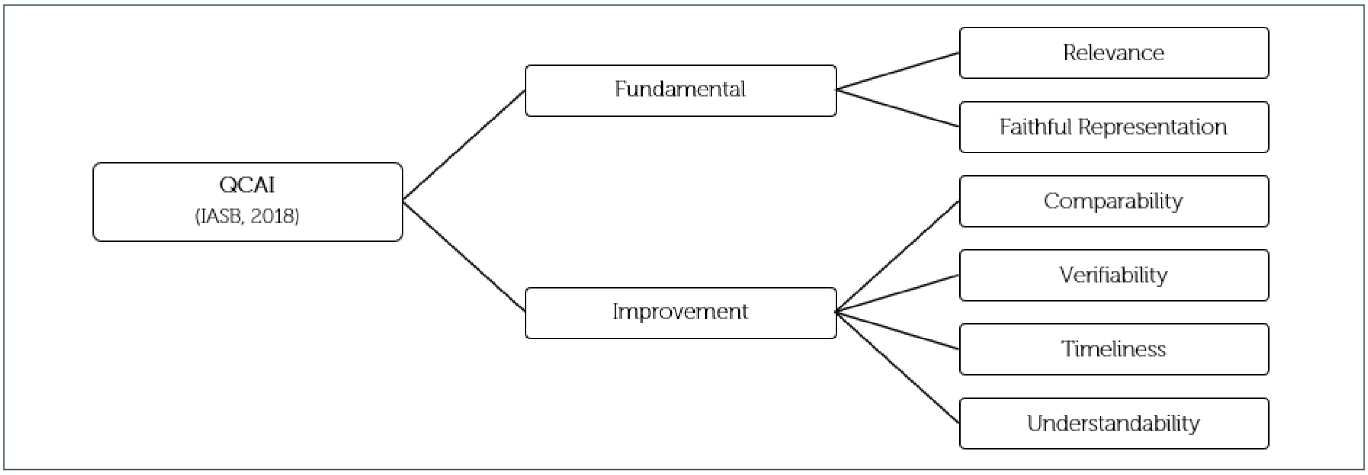
Figure 2. Blockchain characteristics.

The characteristics highlighted in gray represent those understood to be fundamental to blockchain (Treiblmaier, 2019), that is, those from which all others (shown in white) derive (Tapscott & Tapscott, 2016). Also depicted is the construct of trust, which is understood to emerge from the amalgamation of 'immutability,' 'decentralization,' and 'transparency.'

Qualitative characteristics of accounting information (QCUFI)

The International Accounting Standards Committee (IASC), founded in the 1970s as the body responsible for promoting the standardization of international accounting norms, proposed a conceptual framework for the preparation and presentation of financial accounting reports in 1989. Subsequently, under the responsibility of the International Accounting Standards Board (IASB), the entity that replaced the IASC in 2001, this framework was revised in 2010 and once again in 2018.

The framework features 'relevance' and 'faithful representation' as the fundamental characteristics of accounting financial information. For such information to be useful, it must both faithfully represent what it aims to depict and be relevant. Relevant information that lacks faithful representation is of little value, just as faithfully represented information that is irrelevant serves little purpose (IASB, 2018). In addition, the framework introduces 'comparability,' 'verifiability,' 'timeliness,' and 'understandability' as enhancing (and highly desirable) qualitative characteristics, as shown in Figure 3.



Source: Developed by the authors based on International Accounting Standards Board. (2018). *Conceptual Framework for Financial Reporting*. https://www.ifrs.org/issued-standards/list-of-standards/conceptual-framework.html/content/dam/ifrs/publications/html-standards/english/2021/issued/cf/

Figure 3. Qualitative characteristics of accounting information.

The information contained in financial reports represents economic phenomena through numbers and words. According to the definition proposed by the IASB, information is considered relevant when it is capable of making a difference in users' decision-making processes by meeting the informational expectations of stakeholders (IASB, 2018; Moura et al., 2015). Furthermore, relevant information may possess either predictive or confirmatory value. Predictive information, as the term suggests, can be used by users seeking to forecast future outcomes, whereas confirmatory information provides feedback that either confirms or modifies prior evaluations made by one or more users (Barth, 2014; IASB, 2018).

Accounting financial information must also be 'faithfully represented.' To faithfully represent its content, the information must exhibit three attributes: it must be 'complete,' including all information necessary for comprehension; it must be 'neutral,' meaning not devoid of purpose but free from bias, partiality, manipulation, or any inclination intended to steer outcomes toward the interests of particular groups; and it must be 'free from error' — not in the sense of being thoroughly precise, but in ensuring that there are no material errors or omissions in the phenomena described, nor in the processes used to produce the information (IASB, 2018).

As for the enhancing characteristics — which further increase the usefulness of information — 'comparability' is important insofar as it assists users in the decision-making process by allowing them to assess similar information from other entities or from different periods within the same entity (IASB, 2018). 'Verifiability' also enhances the usefulness of information and means that different and independent observers can reach a consensus regarding its content by observing and analyzing it, even if they do not necessarily agree on its interpretation (IASB, 2018). To achieve 'timeliness,' information must be disclosed in time for stakeholders to incorporate it into their decision-making. Additionally, information should be understandable and as concise as possible in order to facilitate its 'understandability.' All these characteristics — both fundamental and enhancing — should be pursued to the greatest extent possible, as perfect information, in practice, is unattainable (IASB, 2018).

Discussion between blockchain and QCUFI characteristics

Firstly, we discuss 'relevance' as a fundamental qualitative characteristic. Information is relevant when it can make a difference in the decisions made by users (IASB, 2018; Moura et al., 2015). When considering materiality, an entity-specific aspect of relevance based on nature, magnitude, or both, one cannot specify a uniform quantitative limit for materiality or predetermine what may be material in a particular situation (IASB, 2018). It is up to interested users to evaluate 'relevance,' and it is unlikely that blockchain impacts this characteristic of the information. Understanding that 'relevance' is not achieved through the process of disclosing information and that, consequently, there is no possible impact of blockchain on how relevant a piece of information may be, the relationships between 'relevance' and blockchain are not considered. The other characteristics of the information are related to the quality of the process of disseminating its content, a process that can be improved with the adoption of blockchain (Al Shanti & Elessa, 2022).

The characteristics of blockchain emerge from the way in which its architecture was proposed, a combination of existing technologies that, when combined, began to enable new perspectives. For example, until the advent of the technology, there were no fully reliable alternatives to 'immutability' in digital media (Tapscott & Tapscott, 2016). In traditional environments, information is maintained and controlled by centralized powers, composed of one or more interested entities. Despite the robust reputation of these entities, there is no way to guarantee immutability. Therefore, blockchain technology enables immutability due to its decentralized architecture (Nakamoto, 2008). Identical copies of the ledger, where the information is kept, are stored under the surveillance of all participants, making it impossible to tamper with an isolated block (O'Leary, 2018; Tan & Low, 2019). The result is an efficient registration process in a secure, transparent, and accurate environment (Bonsón & Bednárová, 2019). Table 4 presents the relationship between this characteristic of blockchain and some of the QCUFI.

Table 4. Immutability and QCUFI.

Characteristics of blockchain	QCUFI	Relationship between blockchain and QCUFI	References
Immutability	Faithful representation	Immutability directly supports the 'faithful representation' of information by ensuring that the original data remains intact and unaltered. This guarantee of integrity enables independent companies to exchange information securely without relying on a trusted intermediary.	Dai and Vasarhelyi (2017); Xu et al. (2017)
	Comparability	The trust that immutability generates among information users also strengthens 'comparability,' as data manipulation becomes impossible. As a result, blockchain-stored data assures users that its comparability is legitimate, since the information being compared remains unchanged.	Kostic and Sedej (2022); Bonsón and Bednárová (2019); Carlin (2019); Smith (2018)
	Verifiability	Immutability enhances 'verifiability,' as the integrity of transaction history and the consensus mechanisms embedded in blockchain technology create a fully verifiable environment. This ensures traceability and enables an efficient, reliable, and secure exchange of accurate information.	Kostic and Sedej (2022); Bonsón and Bednárová (2019); Carlin (2019); Smith (2018)

Note. Developed by the authors.

In blockchain, 'decentralization' and 'immutability' are directly related, because it is through decentralization that immutability becomes viable. In centralized environments, it is impossible to guarantee that information is in fact immutable, even if the entity maintaining the information enjoys a good reputation. Understanding that immutability is a consequence of decentralization, all the relationships evidenced between 'immutability' and QCUFI are also valid for 'decentralization' (Table 5). The relationship between 'decentralization' and 'understandability' and 'decentralization' and 'timeliness' was also verified.

Table 5. Decentralization and QCUFI.

Characteristics of blockchain	QCUFI	Relationship between blockchain and QCUFI	References
Decentralization	Faithful representation	Immutability as a consequence of decentralization (see Table 4).	Dai and Vasarhelyi (2017); Xu et al. (2017)
	Comparability	Immutability as a consequence of decentralization (see Table 4).	Kostic and Sedej (2022); Bonsón and Bednárová (2019); Carlin (2019); Smith (2018)
	Verifiability	Immutability as a consequence of decentralization (see Table 4).	Kostic and Sedej (2022); Bonsón and Bednárová (2019); Carlin (2019); Smith (2018)
	Understandability	Blockchain technology enables information to be stored in a single ledger within a multi-party environment, eliminating the need to reconcile multiple databases. This single ledger operates on a consensus mechanism, enhancing the 'understandability' of information, as all records are jointly developed by users who will later consume the data.	Risius and Spohrer (2017); Kostic and Sedej (2022)
	Timeliness	Storing information in a single location rather than across multiple databases improves 'timeliness.' Transactions occur more quickly between independent users, reducing intentional delays in financial reporting and increasing market efficiency by accelerating information availability.	Risius and Spohrer (2017); Dong et al. (2018); Al Shanti and Elessa (2022); Han et al. (2022); ICAEW (2018); Kostic and Sedej (2022)

Note. Developed by the authors.

The decentralized network structure proposed by Nakamoto (2008), named blockchain due to the chain of blocks added chronologically by its users, has at its origin a proposal of total transparency. Any interested user can join the network, adding information and verifying everything that has already been recorded at any time (Bonsón & Bednárová, 2019; Dai & Vasarhelyi, 2017). The properties that emerge from this technology foster an environment of trust that is viable due to the characteristics of decentralization and consequent immutability, as already noted.

In addition to them, another fundamental characteristic of trust is 'transparency,' as the guarantee of the integrity of information, without its traceability and verification, becomes insufficient. Even in the case of permissioned blockchains, the structure proposed by Nakamoto (2008) allows, upon necessity and consensus, any information recorded in a blockchain to be verified, bringing to light its entire life cycle (Helliar et al., 2020) (Table 6).

Table 6. Transparency and QCUFI.

Characteristics of blockchain	QCUFI	Relationship between blockchain and QCUFI	References
Transparency	Faithful representation	Blockchain enables transparent, reliable, and efficient exchange of data in decentralized networks composed of legally independent stakeholders. This directly enhances 'faithful representation,' as the visibility of the entire transaction history and the transparency of the process ensure that information remains untampered.	Kostic and Sedej (2022)
	Comparability	Since information in a blockchain network is stored transparently, with traceability and visibility ensured through consensus, any interested party can easily access and compare it, strengthening 'comparability.'	Reusen and Stouthuysen (2020); Kostic and Sedej (2022)
	Verifiability	Blockchain's transparent storage and consensus-driven traceability enhance 'verifiability,' allowing any interested party to easily confirm the integrity of shared information.	Reusen and Stouthuysen (2020); Kostic and Sedej (2022)
	Understandability	'Understandability' is also improved through the single, consensus-based record created by users who will later consume the information. Transparency plays a fundamental role in this process, as it enables validation that consensus rules are followed by ensuring full visibility and traceability of recorded data.	Helliar et al. (2020); Kostic and Sedej (2022)
	Timeliness	In a decentralized database where traceability is guaranteed through full process transparency, 'timeliness' is also enhanced. Since all participant information is securely and transparently stored in a single, consensus-based ledger, access to records becomes virtually instantaneous and easily verifiable.	Helliar et al. (2020); Kostic and Sedej (2022)

Note. Developed by the authors.

When Treiblmaier (2019) proposed 'programmability' as a characteristic, the author referred to the possibility of deploying smart contracts, or applications programmed to perform certain tasks when pre-established requirements are met. This characteristic differs from the others, as it is not born as one of the main focuses of blockchain technology. Although the proposed solution to Bitcoin already presents some level of 'programmability,' smart contracts have only gained traction with another important blockchain solution, the platform Ethereum, which originated in 2014 and is currently the second-largest decentralized network operating in the world (CoinMarketCap, 2023).

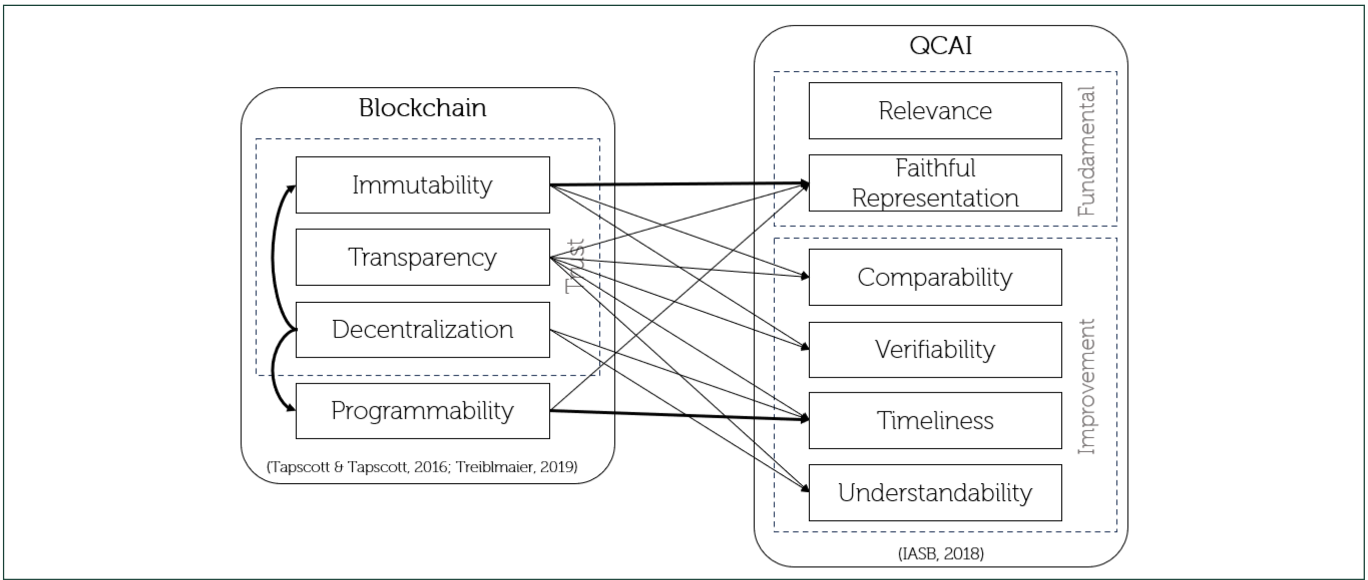
Through smart contract applications, which perform predetermined functions according to previously established rules and by consensus of all participants, trust between independent actors is established, as any possibility of manipulation by any individual alone is also eliminated, since actions become fully automated (Gans, 2019). Looking at it from this perspective, since tasks are performed in an automated way, with accuracy and without the possibility of tampering or manipulation, 'programmability' has the potential to positively impact some of the QCUFI (Table 7).

Figure 4 illustrates the theoretical model developed with all the relationships evidenced and discussed in this section.

Table 7. Programmability and QCUFI.

Characteristics of blockchain	QCUFI	Relationship between blockchain and QCUFI	References
	Faithful representation	The ability to perform tasks automatically, without requiring a trusted intermediary, can enhance the 'faithful representation' of transacted information. When tasks rely on human execution or partial automation with human intermediation — such as validation by institutions — they are subject to both unintentional errors and intentional manipulation, such as fraud. In contrast, fully automated processes provide a higher degree of accuracy in representing the original content, minimizing the risks associated with human interference.	Gans (2019)
Programmability	Timeliness	The implementation of smart contracts enables the automation of numerous tasks that would otherwise require manual execution in centralized environments due to a lack of trust and the dispersion of data across multiple locations. By ensuring reliable and automated mediation between independent partners, smart contracts lead to significant time savings.	Peters and Panayi (2016); Kokina et al. (2017); Yermack (2017); Smith (2018); Bonsón and Bednárová (2019); Babich and Hilary (2020); Olsen and Tomlin (2020)

Note. Developed by the authors.



Source: Developed by the authors based on Treiblmaier, H. (2019). Toward more rigorous blockchain research: Recommendations for writing blockchain case studies. Frontiers in Blockchain, 2., Tapscott, D., & Tapscott, A. (2016). Blockchain revolution. SENAI-SP, and International Accounting Standards Board. (2018). *Conceptual Framework for Financial Reporting.* https://www.ifrs.org/issued-standards/list-of-standards/conceptual-framework.html/content/dam/ifrs/publications/html-standards/english/2021/issued/cf/

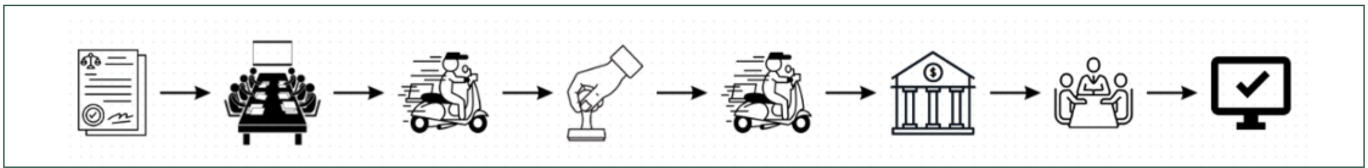
Figure 4. Theoretical model.

Considering the observed relationships, for each characteristic of the blockchain there are at least two relationships found with QCUFI. 'Decentralization' and 'transparency' are the blockchain characteristics that identified relationships with all the QCUFI. In addition, an effort was made to represent the degree of intensity of the relationships through the thickness of the lines, where there is a strong relationship between 'immutability' and 'faithful representation,' and between 'programmability' and 'timeliness.'

CASE STUDY

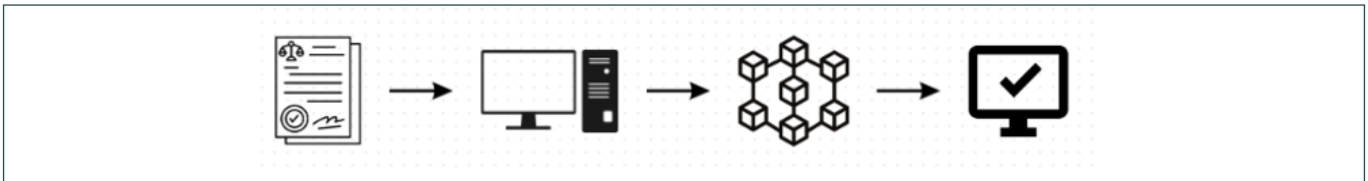
This section presents the results of the case study carried out at Financial Institution X, which developed a blockchain-based solution to improve the exchange of information with one of its key customers. The demand for the development of this solution arose from a concern expressed by one of the main customers of Financial Institution X, due to the slowness in the process of granting and revoking powers for authorized users to carry out financial transactions.

According to Observation 1, a complete cycle of granting powers was observed, and it was noted that the traditional process (without the developed solution) follows a bureaucratic routine. The designation of the people who have powers to make financial transactions in companies begins with the preparation of the power document by the customer, which contains the list of people granted and what powers each of these users must have with the institution. Once the document is prepared within the company, it is sent to the directors responsible for signing it. Subsequently, it is sent to the notary's office for authentication. Only after these procedures can the document be forwarded to the customer relationship agency within the institution. The agency receives the document, performs a preliminary analysis, and sends it to a specific registration sector within the institution, which interprets the content of the document and, if in accordance with it, registers it in the system. Only from this last step onward are the granted users allowed to carry out transactions. For all steps to be completed, the process took eight working days (Figure 5).



Source: Developed by the authors.
Figure 5. Traditional process.

With the solution developed, due to the decentralization made possible through the architecture of the blockchain, the role of intermediaries, both from the notary's office and from the people involved in the transportation and interpretation of the document, is eliminated, and the same process is carried out through direct communication between the client and Financial Institution X, with a greater degree of automation (Figure 6).



Source: Developed by the authors.
Figure 6. Process with blockchain.

In the new process, the two institutions began to access the same content, as the record became unique and shared, allowing changes to be made only by consensus of both parties. With the unification of the data, both the client and Financial Institution X needed to establish a prior standard for understanding the content of the power documents that would be registered — that is, to specify which power each term used refers to — so that both the institution's and the customer's systems could interpret the data in the same way, ensuring that the power registered by the institution represents exactly what the customer intends to represent.

With the guarantee that nothing is changed without the agreement of both parties, and that all records are immutable and completely traceable, the role of the notary, previously necessary to authenticate the documents, was eliminated, and it became possible to automate most processes, also removing the need for other participants involved in the traditional execution of the process. As a result of this new routine, the process of granting and revoking powers went from eight days on average to a few hours, as found in Observation 2, where it was possible to follow the same process of granting powers, but carried out through the blockchain-based solution developed.

Fundamental QCUFI and the characteristics of the blockchain

From the case study carried out, this section examines the relationship evidenced between blockchain and the fundamental qualitative characteristics: 'relevance' and 'faithful representation.'

Relevance

Information is considered relevant when it can significantly influence users' decisions, satisfying the informational needs of stakeholders (IASB, 2018; Moura et al., 2015). As in the proposition of the theoretical model, the data evidenced in the case study present the almost unanimous idea that the 'relevance' of information is not affected by the adoption and use of blockchain technology. Most of the findings corroborate the idea that the 'relevance' of information is not impacted by using blockchain, since this technology does not influence the content of information, as it only acts as a means of transporting it, with its effects perceived only through the changes that occurred in the process of delivering and sharing information.

Interviewee 7 was the only one who brought a different perspective regarding the perceived effects of blockchain on the 'relevance' of the information shared. However, regarding the idea that blockchain is only the means of transporting information, his report corroborates the understanding of the other interviewees. The point of divergence of interviewee 7 from the others is precisely that, for him, there were changes in the content of the information shared — a fact that influenced the degree of 'relevance' of the information. As a motivator for these changes, interviewee 7 brought up an aspect that refers to the prior standardization of information, that is, the need for preliminary treatment of information so that it can be transmitted through the blockchain solution developed. According to his perspective, this factor can be evidenced as an indirect effect of blockchain on the 'relevance' of the information shared.

Although another technology could meet the demand related to the transfer of shared information, blockchain technology, with its decentralized architecture, has the ability to foster environments of trust between participants who do not know each other, without the need for trusted intermediaries (Kostic & Sedej, 2022; Reusen & Stouthuysen, 2020), an essential requirement for the project developed to get off the ground. Even if evidenced by only one of the interviewees, it can be inferred that blockchain, indirectly and through the necessary standardization, had its effects perceived on the 'relevance' of the information shared, when considering the practical investigation carried out in the case study developed.

Faithful representation

To be considered useful, it is not enough that information merely represents a relevant phenomenon; it is necessary that this representation occurs in a way that is faithful to the phenomenon it proposes to represent, seeking to be complete, neutral, and error-free (IASB, 2018). In view of the reports of the interviewees, the observations made, and the documents collected, it is perceived that the relationship evidenced through the case study regarding the 'faithful representation' of the information shared is aligned with the theoretical model developed. Considering the proposed model, relationships are identified between all four characteristics of blockchain and the 'faithful representation,' albeit more indirectly in relation to 'decentralization.'

Frequently, the interviewees mentioned the characteristics of 'immutability,' 'transparency,' and 'decentralization,' along with concepts such as single registration, elimination of intermediaries, traceability, integrity, and security, which reinforce the idea proposed in the theoretical model that there may be a construct referring to the 'confidence' established between the parties. From this, it was possible to verify the possibility of task automation through the characteristic of 'programmability.' Thus, regarding the characteristics of blockchain and the 'faithful representation,' it is observed that the relationships found converged with those established in the theoretical model developed (Table 8).

Table 8. Blockchain vs. faithful representation.

Blockchain x QCUFI	FAITHFUL REPRESENTATION				
	Theoretical model			Case Study	
	Effects are perceived?	Authors		Effects are perceived?	Evidence
Immutability	Yes	Dai and Vasarhelyi (2017); Xu et al. (2017)	X	Yes	Interviewees 1, 2, 6, 9 and 10
Transparency	Yes	Kostic and Sedej (2022); Reusen and Stouthuysen (2020)		Yes	Interviewees 2, 3 and 8; Observation 3
Decentralization	Yes	Risius and Spohrer (2017); Dai and Vasarhelyi (2017); Xu et al. (2017)		Yes	Interviewees 1, 6, 8 and 11
Programmability	Yes	Gans (2019); Kokina et al. (2017)		Yes	Interviewees 1, 6 and 10

Note. Developed by the authors.

Through 'decentralization,' the information held by both participants could be unified, resulting in a single record, shared and updated only by consensus. This 'decentralization,' provided by the blockchain's chained architecture, guarantees the 'immutability' of the data, ensuring that the information will not be distorted and faithfully represents what was initially proposed. This environment of trust is completed through the 'transparency' of the entire process, which makes these guarantees visible and verifiable by all participants.

Once the records are unified, enabling the elimination of intermediaries, and the integrity of the data is guaranteed — traceable and visible to all — task automation becomes feasible. Through 'programmability,' smart contracts are developed to perform most of the tasks previously carried out by manual processes. The result is an automated, secure process that guarantees the same authenticity as the previous process, increasing the degree of 'faithful representation' of the information but without the need for trusted intermediaries, maximizing operational efficiency and reducing to a few hours a routine that previously took an average of eight working days to complete.

Improvement QCUFI and the characteristics of blockchain

Analyzing the possible effects of blockchain technology on the fundamental qualitative characteristics of information, this section examines the perceived relationships between blockchain and the qualitative characteristics considered to be enhancing, which aim to further increase the usefulness of information. Therefore, it is desirable that information be verifiable, comparable, timely, and understandable — an ideal pursued to the maximum extent possible, within the conditions and circumstances in which the information is shared (IASB, 2018).

Verifiability

Regarding 'verifiability,' according to the IASB (2018), it is the characteristic that allows different observers of information to access the same content, reaching a consensus on this content, even if they do not necessarily agree with one another's opinions. Following this concept — that the uniqueness and availability of shared information are guaranteed — blockchain can be useful, since its architecture provides that identical copies of the ledger (where information is stored) are distributed among all network participants, resulting in a single record and ensuring that any attempt to change it is made only by consensus (O'Leary, 2018; Tan & Low, 2019). Table 9 shows the adherence of the theoretical model in relation to the observed reality, highlighting the presence or absence of effects perceived for each blockchain characteristic established in the 'verifiability' of the information shared.

Table 9. Blockchain vs. faithful representation.

	VERIFIABILITY				
Blockchain x QCUFI	Theoretical model			Case Study	
	Effects are perceived?	Authors		Effects are perceived?	Evidence
Immutability	Yes	Kostic and Sedej (2022); Bonsón and Bednárová (2019); Carlin (2019); Smith (2018)		Yes	Interviewees 2, 7, 10 and 12.
Transparency	Yes	Kostic and Sedej (2022); Helliar et al. (2020); Reusen and Stouthuysen (2020); Bonsón and Bednárová (2019); Dai and Vasarhelyi (2017)	X	Yes	Interviewees 1, 4, 8 and 12; Observation 3.
Decentralization	Yes	Kostic and Sedej (2022); Bonsón and Bednárová (2019); Carlin (2019); Smith (2018)		Yes	Interviewees 7, 10 and 11.
Programmability	No	-		Yes	Interviewee 2.

Note. Developed by the authors.

It is inferred that blockchain technology improves the 'verifiability' of the information shared, as it allows the unification of records, provides temporal reference, and enables traceability of the entire transaction history — although this does not mean unrestricted visibility. Thanks to the properties that emerge from its architecture, blockchain allows independent users who do not necessarily trust each other to access the same information, in its original content rather than in copies of shared data, thereby increasing the degree of 'verifiability' and the consequent usefulness of the information shared.

Comparability

While 'verifiability' consists of the ability of different observers to establish consensus regarding given content, a high level of 'comparability' improves the usefulness of information, as it enables the interested user to accurately compare similar information between different entities, or even within the same entity when considering different periods, assisting in decision-making according to their needs (IASB, 2018). Many of the effects perceived on 'verifiability' were also reported for the 'comparability' of the information shared, since the same records that need to be verified by network participants are also the data to be compared when necessary.

According to the theoretical model developed, the maintenance of the entire history of shared information is made possible by the 'immutability' of the data, which in turn originates from 'decentralization,' because any change in the network can only be carried out by consensus of all participants, always maintaining the previous record. This property, native to blockchain technology, establishes that any change made originates from a new record, never replacing an old one (Kostic & Sedej, 2022; Nakamoto, 2008; Smith, 2018). Table 10 shows the adherence of the theoretical model in relation to the observed reality, highlighting the presence or absence of effects perceived for each blockchain characteristic established in the 'comparability' of the information shared.

Table 10. Blockchain vs. comparability.

Blockchain x QCUFI	COMPARABILITY				
	Theoretical model			Case Study	
	Effects are perceived?	Authors		Effects are perceived?	Evidence
Immutability	Yes	Kostic and Sedej (2022); Bonsón and Bednárová (2019); Carlin (2019); Smith (2018)		Yes	Interviewees 1, 2, 6 and 7.
Transparency	Yes	Kostic and Sedej (2022); Reusen and Stouthuysen (2020)	X	Yes	Interviewees 1, 2 and 8.
Decentralization	Yes	Kostic and Sedej (2022); Bonsón and Bednárová (2019); Carlin (2019); Smith (2018)		Yes	Interviewees 2, 6, 7 and 9.
Programmability	No	-		No	-

Note. Developed by the authors.

Regarding the 'comparability' of the information, conclusively, the correspondence verified between the proposed theoretical model and the case study carried out corroborates the argument that blockchain technology improves the 'comparability' of the information shared. From the guarantee of data 'immutability,' the maintenance of all history, and the traceability of all transactions, the 'comparability' of the information has its legitimacy assured, given that data manipulation becomes impossible and any attempt at alteration is easily verifiable.

Not only is the 'comparability' of information improved, as is the need to compare data between participants of the same blockchain network, since everyone now accesses the same record due to the 'decentralized' custody of this data, which also makes it possible for losses of information due to physical problems, file corruption, or even cyberattacks to be mitigated. The 'transparency' provided by the blockchain technology architecture once again presents itself as complementary to the other characteristics of blockchain, contributing to the improvement of 'comparability' of information, as it allows the visualization and verification of everything transacted on the network by all participants.

Understandability

Information has its usefulness improved when classified and characterized appropriately (IASB, 2018). This implies that it is presented concisely, that is, with a high degree of 'understandability.' Regarding the results obtained through the case study, it is perceived that the effects on the 'understandability' of the information shared refer to the 'decentralization' and 'transparency' provided by blockchain technology. Considering the reports of the interviewees in general, the main point evidenced is the prior consensus necessary for the development of the new solution and its consequences. The logic of their arguments follows the same proposal as the theoretical model, according to which prior consensus enables the unification of records, which, in turn, ends up requiring prior standardization of information, providing a single language that can be interpreted by the same users.

Depending on the 'decentralization' of the custody of shared data, unifying the previously individualized and independent databases into a single, completely verifiable record due to the 'transparency' enabled by blockchain technology, the interviewees highlighted the fact that participants needed to establish a standard in understanding the powers to be granted and in the procedures for granting and revoking them, even before the solution was developed. Thus, the developed solution is born as a result of consensus between the parties, that is, everything that is transmitted through the network is the result of the joint development of the participants themselves who will later consume the information.

Table 11 presents the adherence of the theoretical model in relation to the observed reality, highlighting the presence or absence of effects perceived by each characteristic of blockchain on the 'understandability' of the information shared. The total correspondence between the ideas proposed in the theoretical model and the findings of the case study is verified.

Table 11. Blockchain vs. understandability.

Blockchain x QCUFI	UNDERSTANDABILITY				
	Theoretical model			Case Study	
	Effects are perceived?	Authors		Effects are perceived?	Evidence
Immutability	No	-	X	No	-
Transparency	Yes	Kostic and Sedej (2022); Han et al. (2022); Reusen and Stouthuysen (2020); ICAEW (2018)		Yes	
Decentralization	Yes	Kostic and Sedej (2022); Han et al. (2022); ICAEW (2018)		Yes	Interviewees 1, 2 and 11.
Programmability	No	-		No	-

Note. Developed by the authors.

In this way, it can be concluded that blockchain technology positively impacts the 'understandability' of information. Due to 'decentralization,' blockchain establishes the need for consensus even before the records are made. Therefore, users' understanding of information naturally has a high degree, since the prior consensus required to arrive at the final product of the information was obtained by the same users who later consume it. Through the 'transparency' promoted as a native feature of its architecture, blockchain also improves the understanding of information, as it guarantees participants that they are actually consuming the same information through a single and verifiable record. This does not occur in solutions developed from other centralized technologies, where several and often different databases are needed, stored in distinct locations, due to the inability of these technologies to establish trust between independent actors.

Timeliness

Information also has its usefulness improved when it is made available in a timely manner, that is, in time to influence the decision-making of its users (IASB, 2018). In the theoretical model developed regarding 'timeliness,' among the four characteristics of blockchain established, relationships were found with 'decentralization,' 'transparency,' and 'programmability.' It is verified that the results evidenced in the case study fully adhere to the proposed theoretical model, since, in addition to the effects of 'immutability' on the 'timing' of information, the other characteristics of blockchain also demonstrated relationships through similar dynamics, as systematized in Table 12.

Table 12. Blockchain vs. timeliness

Blockchain x QCUFI	TIMELINESS				
	Theoretical model			Case Study	
	Effects are perceived?	Authors		Effects are perceived?	Evidence
Immutability	No	-	X	No	-
Transparency	Yes	Kostic and Sedej (2022); Helliar et al. (2020); Reusen and Stouthuysen (2020)		Yes	Observations 3 and 8.
Decentralization	Yes	Han et al. (2022); Kostic and Sedej (2022); ICAEW (2018); Dong et al. (2018); Risius and Spohrer (2017)		Yes	Interviewees 3, 7 and 9.
Programmability	Yes	Olsen and Tomlin (2020); Babich and Hilary (2020); Bonsón and Bednárová (2019); Smith (2018); Yermack (2017); Kokina et al. (2017); Peters and Panayi (2016)		Yes	Interviewees 4, 6 and 8.

Note. Developed by the authors.

The evidence found allows the inference that the 'timeliness' of information can be improved through the adoption and use of blockchain. In addition to the possibility of unifying records previously held in different locations — which required lengthy and laborious reconciliation processes — blockchain makes it possible to eliminate the need for trusted intermediaries to ensure the legitimacy of transactions. The prior consensus established by the users who consume the generated information, also subject to verification according to the 'transparency' provided by the technology, allows independent actors to interact with each other without the need for mutual trust, since blockchain itself establishes trust between the parties.

In environments where no trust is established between the actors involved, sensitive tasks that would traditionally be supervised and often even performed by humans — such as data processing, interpretation, and validation — can be completely automated, representing a substantial increase in the 'timeliness' of the information shared. It might be thought that the 'programmability' of blockchain — the characteristic that enables this automation through the development of smart contracts — may not offer additional benefits compared to other technological solutions that may even have a greater capacity to meet this demand. However, it is due to its unique ability to instill trust in a decentralized environment, where multiple actors operate independently, that blockchain stands out from other centralized technologies.

DISCUSSION

The theoretical model developed, coupled with its practical application in a financial institution, underscores how key blockchain attributes — immutability, decentralization, transparency, and programmability — directly enhance the relevance, faithful representation, comparability, verifiability, timeliness, and understandability of financial information. The findings highlight that decentralization and transparency are particularly impactful, as they establish relationships with all QCUFI, thereby fostering a more reliable and efficient accounting ecosystem.

The accounting implications are profound. The inherent immutability of blockchain records can drastically reduce the incidence of fraud and errors, leading to financial statements that more faithfully represent an entity's economic reality (Bonsón & Bednárová, 2019; Kostic & Sedej, 2022). This enhanced integrity is relevant for stakeholders who rely on financial information for decision-making (Alkafaji et al., 2023). Furthermore, the transparency facilitated by distributed ledgers can improve auditability and accountability, as transactions are verifiable by all authorized participants in real time, shifting from traditional periodic audits to continuous assurance (Centobelli et al., 2021; Dyball & Seethamraju, 2021; Han et al., 2022). Decentralization, by removing intermediaries, streamlines processes and reduces transaction costs, which can result in more timely financial reporting (Alkafaji et al., 2023; Barth, 2014). This characteristic also democratizes access to financial data, potentially empowering a broader range of users with relevant and up-to-date information. Through smart contracts, programmability introduces automation into accounting processes — from revenue recognition to expense management — minimizing human intervention and the associated risks of error or manipulation (Gans, 2019). This automation not only increases efficiency but also ensures consistency in the application of accounting rules.

The model's practical illustration within a financial institution demonstrates the feasibility and benefits of integrating blockchain into existing accounting frameworks. It suggests that the adoption of this technology is not merely a theoretical advancement but a tangible solution for improving information exchange and quality in real-world scenarios. For the accounting profession, this necessitates a shift in skill sets, emphasizing technological literacy, data analytics, and an understanding of distributed ledger technologies (Fang et al., 2023; Zhou et al., 2022). Accountants will evolve from mere record-keepers to strategic advisors, leveraging blockchain-enhanced information to provide deeper insights and support more informed business decisions (Alkafaji et al., 2023). While the benefits are clear, the transition to blockchain-based accounting systems presents challenges, including regulatory adaptation, interoperability with legacy systems, and the need for standardized protocols. Nevertheless, this study firmly establishes blockchain as a pivotal technology poised to redefine the landscape of financial information, offering unprecedented levels of trust, efficiency, and reliability in accounting practices.

FINAL CONSIDERATIONS

In this study, the objectives were to define a theoretical model based on the discussion of the effects that emerge from the adoption and use of blockchain in the QCUFI and, based on this model, to illustrate the perceived effects of blockchain in QCUFI in a real application case carried out in a financial institution that developed a solution to improve the exchange of information with its customers. The theoretical model was developed through interpretative and content analysis based on 69 scientific articles, in addition to works cited in these articles and other publications identified as relevant to the proposed content. The case study was conducted through observations, document collection, and semi-structured interviews with participants in the real case of application of blockchain technology.

Regarding the relations proposed through the theoretical model between blockchain and QCUFI, in general, these could also be found in the case study, and it was possible to infer that the proposed theoretical model represents, for the most part, the effects of blockchain on QCUFI. Except for findings related to 'verifiability,' where the case study revealed an additional effect from the perspective that 'programmability' regulates the privacy of information as needed by the parties, all other QCUFI showed effects of blockchain evidenced in the same way, both in the theoretical model and in the case study. The idea proposed in the theoretical model is that 'decentralization' originates 'immutability' and that, when added to 'transparency,' it results in the construct 'confidence.' This was also verified in the case study, given the numerous mentions by interviewees of these characteristics and concepts such as integrity, security, and reliability.

As a theoretical contribution, this study presents itself as an alternative to the gaps evidenced by

Centobelli et al. (2021), as it proposes a standard as a starting point for analyzing the effects of blockchain in the accounting context and contributes to bridging the knowledge gap among blockchain developers, accounting professionals, and academics. Considering that there are few studies investigating the effects of blockchain on accounting information and that blockchain presents itself as a technology with the potential to impact the way it is transacted, this research contributes not only by evidencing some of these possible impacts but also by validating them through the analysis of an empirical experiment in a real case of blockchain technology application.

This article also contributes to theory by establishing a clear suggestion of blockchain characteristics to assist future studies that also aim to investigate the possible effects of this technology in the accounting field. With the clear definition of blockchain characteristics suggested here, researchers have an established theoretical lens as a starting point, facilitating the relationship between technology and their object of study. In addition to delimiting blockchain characteristics for future research, the theoretical model developed also establishes and justifies several possible effects of the technology on accounting information, suggesting that these relationships also be tested in other segments, among the various specific areas of accounting, as well as in other practical cases of blockchain application in business.

As a practical contribution, the model will serve as a mainstay for academics and managers to translate the application of blockchain in their studies and businesses, including for evaluating whether blockchain adoption in a specific case is indeed presented as a useful resource. The data collection instrument developed can also be used as a reference for future studies to evaluate users' perceptions of blockchain solutions developed. It is suggested that research continues in other cases of blockchain application to identify whether the effects evidenced are also verified in other segments and to assess where divergences may be found, if any. In addition, a longitudinal study could be carried out to evaluate the perception of individuals who use a blockchain solution over a certain period, analyzing possible changes in their perceptions over time.

As a limitation of the study, specifically regarding the case study carried out, the results obtained cannot be generalized. Another aspect is that the data analyzed were those provided by professionals involved in the case who work at the financial institution. Thus, it is suggested that, for future studies, cases should be sought in which all actors involved in the established ecosystem can be heard.

Also, as a limitation of this study, it is verified that the analyzed ecosystem was formed by only two participants, potentially reducing the effects of blockchain when compared to other technologies. Even so, it was possible to verify the unique capacity of blockchain to promote trust in environments composed of independent actors, when compared to other centralized technologies. As a suggestion for future research, given the natural evolution that this emerging technology should follow toward maturity, it is recommended to seek cases with a larger number of participants to analyze the possible effects of blockchain on QCUFI in contexts where decision decentralization is an essential requirement, due to the greater number of independent actors involved in the relationships analyzed.

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APPENDIX A — INTERVIEW SCRIPTS

This interview aims to collect information on the participants' perceptions regarding the specific case of blockchain technology application selected, particularly concerning the potential effects of adopting and using this technology on the Qualitative Characteristics of Useful Financial Information (QCUFI). The objective is to validate, through a practical case, a theoretical model that has already been developed. The interview process will include initial questions to gather profile data, followed by questions related to the participant's involvement and perception of the developed project.

Interviewee Profile

Name:
Age:
Academic background:
Current position:
Company tenure:
Experience with blockchain-related projects:

General Information

1. What is this blockchain technology application project, and what is your role in it?
2. How was this process carried out before the implementation of this project?
3. Why was blockchain chosen over other technologies?
4. What benefits have been observed with the project's implementation?
5. What challenges were encountered during the project's implementation?

Blockchain and Relevance (characteristic not considered in the theoretical model): Relevance (CPC 00 / IASB)

Relevant financial information is capable of making a difference in the decisions made by users. Information may be capable of making a difference in a decision even if some users choose not to take advantage of it or are already aware of it from other sources.

6. In this project, does the use of blockchain technology affect the relevance of the information transacted between the involved actors? In what way? What effects are observed?
7. What specific aspects or features of blockchain technology do you believe contribute to enhancing the relevance of this information?

Blockchain and Faithful Representation (Atzori, 2015; Kokina et al., 2017; Kostic & Sedej, 2022; Schmitz & Leoni, 2019; Xu et al., 2017; Yu et al., 2018): Faithful Representation (CPC 00 / IASB)

To be useful, financial information must not only represent relevant phenomena, but it must also faithfully represent the substance of the phenomena that it purports to represent [...] To be a perfectly faithful representation, a depiction would have three characteristics. It would be complete, neutral and free from error. Of course, perfection is seldom, if ever, achievable. The Board's objective is to maximize those qualities to the extent possible.

8. In this project, does the use of blockchain technology affect the faithful representation of the information shared among the actors involved? In what way? What effects are observed?
9. What characteristics of blockchain technology do you consider most relevant to improving the faithful representation of this information?

Blockchain and Comparability (Han et al., 2022; Kostic & Sedej, 2022): Comparability (CPC 00 / IASB)

Users' decisions involve choosing between alternatives, for example, selling or holding an investment, or investing in one reporting entity or another. Consequently, information about a reporting entity is more useful if it can be compared with similar information about other entities and with similar information about the same entity for another period or another date.

10. In this project, does the use of blockchain technology impact on the comparability of information among the actors involved? In what way? What effects are observed?
11. In this regard, what specific properties of blockchain technology facilitate the comparison of information across different periods or entities?

Blockchain and Verifiability (Han et al., 2022; Kokina et al., 2017; Kostic & Sedej, 2022): Verifiability (CPC 00 / IASB)

Verifiability helps assure users that information faithfully represents the economic phenomena it purports to represent. Verifiability means that different knowledgeable and independent observers could reach consensus, although not necessarily complete agreement, that a particular depiction is a faithful representation.

12. In this project, does the use of blockchain technology contribute to the verifiability of information shared among the involved actors? In what way? What effects are observed?
13. What project features or blockchain functionalities do you consider fundamental for enabling more efficient verification of this information?

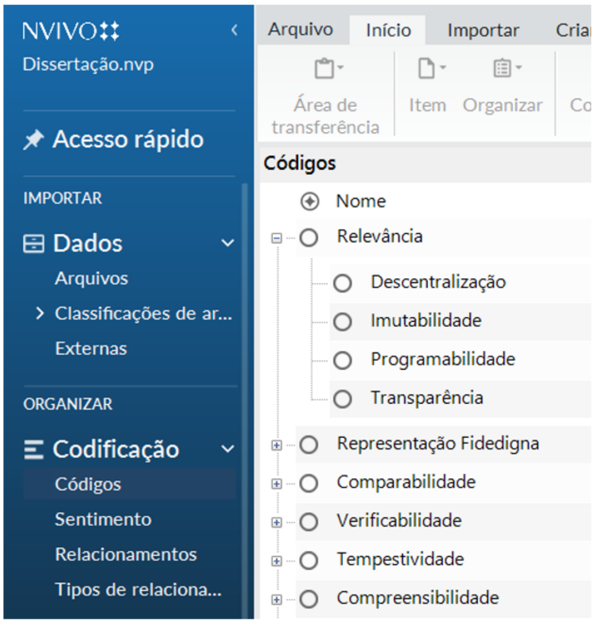
Blockchain and Timeliness (Dong et al., 2018; ICAEW, 2018; Olsen & Tomlin, 2020): Timeliness (CPC 00 / IASB)
Timeliness means having information available to decision-makers in time to be capable of influencing their decisions.
14. In this project, does the use of blockchain technology impact on the timeliness of the information shared among the involved actors? In what way? What effects are observed?
15. If applicable, what specific blockchain properties contribute to increasing the timeliness of information and, consequently, the processes involved?

Blockchain and Understandability (Al Shanti & Elessa, 2022): Understandability (CPC 00 / IASB)
Classifying, characterizing and presenting information clearly and concisely makes it understandable.
16. In this project, does the use of blockchain technology contribute to increasing the understandability of information shared among the involved actors? In what way? What effects are observed?
17. What specific characteristics of blockchain technology do you believe make information clearer and easier for users to understand?

APPENDIX B — ENCODING CRITERIA AND SIMILAR MEANS

As a data analysis procedure, content analysis (Bardin, 2011) was used to analyze all the data collected in the case study. This technique is appropriate for research documented in written texts (internal and external organizational documents), interviews, and outputs derived from observation (Bardin, 2011; Hair et al., 2009; Freitas & Janissek, 2000). It is important to highlight that the content analysis was predominantly theory-driven, as it aimed to illustrate the relationships identified in the Theoretical Model without restricting the analysis solely to these pre-identified relationships. Thus, as initial categories, all constructs of the model and their interrelations (including those not initially identified in the literature) were considered.

To operationalize content analysis, the data obtained through observation, document collection, and semi-structured interviews were transcribed and organized in NVivo 14, a software tool designed to assist in data organization and analysis. As shown in the figure below, the case study data were initially categorized according to the qualitative characteristics of useful financial information (QCUFI), with blockchain characteristics defined as secondary categories within each QCUFI.



Since the Theoretical Model aims to relate the potential effects of blockchain characteristics to QCUFI, the interviews were conducted in a way that encouraged participants to express their perceptions of these effects without being directly presented with the predefined blockchain characteristics. In this regard, the interview script was structured with questions solely related to QCUFI so that respondents would naturally describe which effects and blockchain characteristics impacted the financial information, based on their experiences during the development and use of the implemented solution. Therefore, it is understood that the model relationships observed in the interviews emerged naturally, without the interviewees being aware of either the Theoretical Model developed or the blockchain characteristics previously conceptualized in this study.

From this perspective, the data obtained from the case study were analyzed and categorized in a manner that is both inverse and complementary to the path taken in the development of the Theoretical Model. That is, while the model considered the potential effects on QCUFI based on predefined blockchain characteristics, the case study began with QCUFI as the starting point, allowing blockchain characteristics to emerge naturally, without any pre-established concept. This approach aimed to assess the degree of alignment between the developed theoretical model and the observed reality.