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Review Paper

The Impact of Cryptocurrencies and Blockchain Technologies on the Accounting and Audit Systems

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ABSTRACT

Against the backdrop of the swift evolution of digital technologies, cryptocurrencies, and blockchain have emerged as pivotal elements exerting a profound influence on accounting systems. These technological advancements present novel challenges to accounting professionals, necessitating an adjustment to evolving conditions and the formulation of innovative standards. The study's findings indicate a significant heterogeneity in the regulation of cryptocurrencies, posing challenges to the establishment of uniform accounting methodologies. Examination of diverse national regulatory frameworks underscores the imperative for international coordination. Emphasis is placed on the potential of blockchain as a secure accounting system, specifically its capacity to uphold data integrity and transparency through triple-entry accounting. A pivotal concept involves the implementation of a triple-entry accounting system. This mechanism facilitates the recording of each transaction on a decentralized ledger, accompanied by a distinctive identifier and timestamp, thereby enhancing levels of verification and transparency. Such an approach significantly contributes to the reliability and security of financial records. The study underscores the challenges associated with standardization and regulation within the realm of cryptocurrencies and blockchain technologies. The authors advocate for the implementation of an accounting standard tailored to cryptocurrencies, with a primary objective of enhancing transparency, consistency, and effective risk management. The study analyzes the current role of cryptocurrencies and blockchain technologies in the audit system and forecasts their future impact. Risk assessment associated with the widespread use of cryptocurrencies and blockchain in accounting audits has been implemented. Several dangers accompanying the further integration of blockchain into information systems have been identified, and a set of preventive measures has been proposed, which is advisable to apply within the overall trend of financial audit digitization. It is argued that the global trend of using cryptocurrencies and blockchain technologies provides an opportunity to streamline the processes of collecting and accumulating audit information. Priority trends in the evolving audit system reflecting the general development vector are investigated. It is proven that intensifying the use of digital tools allows for the formulation of precise and effective solutions in complex analytical processes.

The research results are characterized by practical value for the improvement of the modern accounting and audit system in the context of the globalization of digitization and artificial intelligence technologies implementation.

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HIGHLIGHTS

- Cryptocurrencies and blockchain technologies present transformative opportunities for the accounting system, ushering in a technological revolution that challenges and reshapes fundamental tenets of accounting, auditing, and financial management.
- The integration of digital currencies and blockchain into accounting systems demands the formulation of novel accounting standards, considering the diverse legal and regulatory frameworks, and while these innovations enhance transparency and efficiency, they also introduce challenges requiring careful consideration of environmental impacts, international coordination, and technical requirements.

Keywords: Cryptocurrencies, blockchain technologies, accounting systems, management, finance

In the context of the rapid development of the informational potential of the digital economic space in Ukraine, the issue of digitizing the audit system becomes of paramount importance. The situation is intensified by fast-paced innovation and technological progress, along with the digital transformation of economic processes, as well as the trend of Ukraine's integration into the European economic space. These conditions create an evident necessity for the transformation of the accounting and financial audit system concerning the active implementation of cryptocurrencies and blockchain technologies.

Within the continuously shifting global economic landscape, cryptocurrencies and blockchain technologies emerge as pivotal catalysts for transformative change. This introduction scrutinizes their influence on accounting systems. The evolution of digital assets and blockchain signifies not merely a technological revolution but also prompts a reevaluation of the fundamental tenets of accounting, auditing, and financial management.

Cryptocurrencies are affecting substantial changes to the system of currency relations and payment mechanisms, necessitating adaptability in accounting systems to accommodate new types of assets and transactions. Concurrently, blockchain presents revolutionary approaches to ensuring transparency, security, and data integrity, with the potential to significantly transform accounting and auditing standards.

This article examines the influence of emerging technologies on shaping accounting practices, delineates the challenges confronting accountants and auditors, and delineates their impact on the evolution of new standards in this domain. Particular emphasis will be placed on the facets of integrating cryptocurrencies into financial reporting systems, elucidated through specific cases and scenarios that illustrate both the potential and challenges inherent in this transformative process.

The article will additionally scrutinize potential risks and challenges associated with cryptocurrencies, encompassing issues such as price volatility, legal uncertainties, and security concerns. In light of these challenges, a discourse will ensue on the prospective evolution of accounting systems to adeptly incorporate these emerging technologies, ensuring precision, transparency, and adherence to pertinent regulatory requirements.

Despite significant scientific achievements, it is essential to emphasize that further scientific development is required to address the regulatory issues surrounding the digitization of accounting, particularly concerning the active implementation of cryptocurrencies and blockchain technologies. Additionally, preventive measures against potential risks and challenges are necessary. The symbiosis of the overall trend of digitizing the financial audit system with the opportunities presented by the use of cryptocurrencies, as well as the optimization of the qualitative characteristics of the investigated process, is positioned as a priority concept in the transformation of economic processes.

The study aims to identify the forms and pathways of influence exerted by cryptocurrencies and blockchain technologies on the contemporary accounting system.

Analytical Literature Review

The subject of our investigation draws the attention of specialists on both sides of the Atlantic Ocean. The study conducted by Alsalmi, Ullah, & Rafique (2023) delves into the examination of digital currency accounting, a critical dimension for comprehending the influence of cryptocurrencies on conventional accounting systems. Analogous concerns are explored in the work of ALSaqa, Hussein, & Mahmood (2019), with a specific emphasis on the ramifications of blockchain on accounting information systems.

Ayedh, Echchabi, Hamid, & Salleh (2021) investigate the ramifications of cryptocurrencies and blockchain on audit and accounting practices, with a specific focus on the Malaysian context. This facet is elaborated upon in the systematic literature review conducted by Bellucci, Cesa Bianchi, & Manetti (2022), which provides a comprehensive examination of the application of blockchain in both accounting practice and research.

Bonsón & Bednárová (2019) extend the discourse on this subject by investigating the influence of blockchain on accounting and auditing. These insights are augmented by a review conducted by Bonyuet (2020), which centers on the broader impact of blockchain on audit activities.

The investigation conducted by Brukhanskyi & Spilnyk (2019) advances the discourse on cryptographic objects within the accounting system, elucidating their significance within the framework of contemporary accounting systems. This dimension is further elaborated upon by Coyne & McMickle (2017), which delves into the feasibility of leveraging blockchains for accounting purposes.

Dai & Vasarhelyi (2017) provide a prospective examination of the future landscape of accounting and auditing within the context of blockchain, crucial for comprehending the transformative trends in this domain. Faccia (2020) introduces the concept of X-Accounting®, expounding upon the application of blockchain in accounting and delineating its advantages over traditional methods.

Conversely, Faccia & Mosteanu (2019) examine the shift from double-entry to triple-entry accounting facilitated by blockchain. Fischer (2018) directs attention to the ethical and professional dimensions of blockchain ledgers, underscoring the significance of this subject for professional development.

The paper authored by Fuller & Markelevich (2020) posits the inquiry of whether accountants should allocate attention to blockchain, analyzing its potential and challenges within the profession. Lastly, George & Patatoukas (2021) scrutinize the evolution and revolution of blockchain in accounting, offering a comprehensive analysis of its influence on effective financial decision-making.

The investigation conducted by Jiménez-Serranía, Parra-Domínguez, De La Prieta, & Corchado (2021) scrutinizes the influence of cryptocurrencies on financial markets, centering on aspects of regulation, economic considerations, and accounting implications. This perspective is augmented by a study authored by Kaplan (2021), which delves into the utilization of blockchain for auditing within the context of corruption and cryptocurrencies.

Kizi Mirsadikova (2023) directs attention to the accounting treatment of cryptocurrencies, highlighting their escalating significance within accounting systems. This perspective is supplemented by the research conducted by Kucharova, Pfeiferova, & Lőrinczova (2021), which delves into the particulars of cryptocurrencies concerning accounting, taxation, and finance in the context of a globalized environment.

Lardo, Corsi, Varma, & Mancini (2022) perform a bibliometric analysis that delves into the role of blockchain in the accounting domain, showcasing the extensive array of research within this realm. This is supplemented by the work of Luchkin, Lukasheva, Novikova, Melnikov, Zyatkova, & Yarotskaya (2020), which addresses the challenges associated with cryptocurrencies in the global financial system and explores strategies for overcoming them.

Martinčević, Sesar, Buntak, & Mililoža (2022) center their attention on the accounting and tax regulation of cryptocurrencies, contextualizing them within complex systems. In parallel, Mosteanu & Faccia (2020) investigate digital systems and the emerging challenges for financial management, encompassing FinTech, XBRL, blockchain, and cryptocurrencies. Their work highlights the extensive spectrum of applications for these technologies.

The investigation conducted by Mosteanu & Faccia (2020) scrutinizes the emerging challenges in financial management within digital systems, encompassing FinTech, XBRL, blockchain, and cryptocurrencies. This study aligns with the research of Muravskyi, Pochynok, Reveha, & Chengyu (2022), which specifically concentrates on the accounting and control of international electronic transactions utilizing cryptocurrencies.

Pashkevych, Bondarenko, Makurin, Saukh, & Toporkova (2020) investigate the utilization of blockchain technology in the accounting and management of contemporary enterprises. This approach is further expanded upon in the study conducted by Pimentel & Boulianne (2020), which explores prevailing trends and potential future opportunities for the application of blockchain in both accounting research and practice.

Procházka (2018) provides a comparative analysis and evaluation of various accounting models for Bitcoin and other cryptocurrencies in alignment with IFRS. This subject is further elucidated in the study conducted by Pugna & Duţescu (2020), which concentrates on blockchain from an accounting perspective.

Sarwar, Iqbal, Alyas, Namoun, Alrehaili, Tufail, & Tabassum (2021) investigate the utilization of "data vaults" as a means to bolster blockchain-based accounting information systems, highlighting novel opportunities within the accounting domain.

Zadorozhnyi, Muravskyi, & Shevchuk (2018) scrutinize the management accounting of electronic transactions involving cryptocurrencies, offering insights into their effects on financial performance. This study aligns with the research conducted by Makurin (2020), who concentrates on the representation of cryptocurrencies in accounting, emphasizing their significance in modern economic systems.

The systematic literature review conducted by Yildirim & Kelten (2021) concentrates on blockchain and its potential impacts on accounting. Their findings dovetail with the study carried out by Yuan & Wang (2018), which systematically analyzes the models, techniques, and applications of blockchain and cryptocurrencies.

Finally, Sokolenko, Ostapenko, Kubetska, Portna, & Tran (2019) scrutinize the economic nature of cryptocurrencies and the nuances of their accounting, offering crucial insights for comprehending their role in financial systems. This study is seamlessly integrated with the work of Yatsyk (2018), who formulated a methodology for the financial accounting of cryptocurrencies following IFRS.

In summarizing the literature review, it is evident that numerous studies concentrate on elucidating the economic nature of cryptocurrencies and adjusting accounting practices to meet the novel demands of blockchain. However, notable gaps persist. These include an inadequate empirical foundation marked by a scarcity of practical case studies, a dearth of attention to regulatory and legal considerations, a lack of standardized or unified accounting methodologies for cryptocurrencies, and a paucity of international comparisons. These deficiencies underscore the imperative for more comprehensive and diversified research efforts in this domain.

Methodology

The envisaged study adopts a comprehensive methodology comprising a literature review of scientific papers and publications, an analysis of data on the utilization and influence of cryptocurrencies and blockchain technologies on accounting systems, an examination of the regulatory framework governing cryptocurrency accounting, and an evaluation of the environmental aspects associated with cryptocurrency mining. This methodological approach is intended to facilitate a deeper understanding of the intricate interplay between cutting-edge financial technologies and conventional accounting systems.

RESULTS

(I) Examining the legal and regulatory frameworks impacting the accounting for cryptocurrencies necessitates a comprehensive understanding of both international and national regulations. Presently, there is significant heterogeneity in the approaches to regulating cryptocurrencies, spanning from full acknowledgment and integration into the financial system to complete prohibition or imposition of restrictions on their use. This diversity poses considerable challenges for accountants and auditors in formulating consistent methodologies for accounting for cryptocurrencies.

At the international level, the absence of uniform accounting standards for cryptocurrencies introduces challenges in international reporting and auditing. Various countries adopt distinct legal and tax regimes, complicating efforts to standardize accounting procedures globally. This divergence poses additional challenges in accounting and reporting for businesses operating in multiple jurisdictions.

In countries where cryptocurrencies are deemed legal, inquiries emerge regarding their classification—

whether as currencies, financial instruments, or other assets. This classification significantly influences the accounting standards applied for the measurement, recognition, valuation, and reporting of these assets. Formulating a methodology for accounting and tax compliance becomes a challenging task, particularly given the context of the high volatility inherent in cryptocurrency prices.

Moreover, within the auditing context, there arises a demand for novel tools and techniques to efficiently audit cryptocurrency transactions. Auditors must consider the intricacies of blockchain technologies, encompassing aspects like transactional anonymity and data distribution, which pose challenges to conventional audit methodologies.

Given these considerations, future research must concentrate on formulating adaptable yet uniform approaches to cryptocurrency accounting, considering the varied regulatory frameworks. For instance, in the United States, cryptocurrencies are categorized as property for tax purposes, mandating the documentation of all transactions for capital gains or losses. In Japan, conversely, cryptocurrencies are acknowledged as legal tender but taxed as income. Within the European Union, approaches diverge among member states; for instance, Germany recognizes cryptocurrencies as "private money," whereas Estonia is actively developing a regulatory framework for cryptocurrencies.

The latter is among the foremost nations in cryptocurrency regulation, and an examination of its experience in the context of our issue is highly pertinent. Estonia's regulatory framework encompasses key aspects such as licensing, Know Your Customer (KYC) policies, and tax regulation. Specifically, Estonia mandates that companies engaged in cryptocurrency operations must acquire a license, a requirement applicable to both cryptocurrency exchanges and wallet providers. The Know Your Customer policy entails that companies must enforce rigorous customer identification procedures to mitigate the risks of money laundering and terrorist financing. The final component of the aforementioned framework pertains to tax regulation: cryptocurrencies in Estonia attract taxation when converted into fiat money or utilized for payments for goods and services (Estonia Cryptocurrency, 2023). It is noteworthy that the process of acquiring a license for conducting operations with cryptocurrencies involves adherence to a set of stringent requirements that encapsulate the essence of the country's approach to regulating digital currencies. Entities intending to furnish services for the exchange or transfer of virtual currencies are obliged to determine their authorized capital, contingent upon the type of service, and institute high-security IT systems for the effective identification and verification of individuals. Additionally, they must submit a comprehensive business plan encompassing financial forecasts for two years, adhere to internal control and audit standards, and remit a state fee of EUR 10,000. All these stipulations directly impact accounting systems, enhancing their transparency and reliability.

The diverse array of approaches to the legal regulation of cryptocurrencies, along with the disparate accounting methods employed, poses challenges in devising a unified global accounting system for cryptocurrencies. This situation impedes the organic progression of the market and capital, hinders economic growth, and introduces complexity into economic relations by presenting at times insurmountable challenges for accounting systems.

(II) Blockchain technologies, comprising distributed databases that establish an ever-expanding record of data resistant to tampering or alteration by node operators, hold the promise of serving as a secure information accounting system. The primary strength of blockchain lies in the irreversible nature of transactions once sanctioned by network nodes (Levytska *et al.* 2022). This feature is critical for upholding the integrity of the blockchain and guaranteeing that all participants possess precise and uniform records. This distinctive advantage is attributed to a component of the blockchain system known as triple-entry accounting.

Triple-entry accounting within the framework of blockchain represents an extension of the conventional double-entry accounting model. In this paradigm, alongside the customary debiting and crediting of accounts, each transaction is further documented on a distributed ledger, such as a blockchain. Consequently, every transaction is allocated a unique identifier and timestamp, affording an added layer of verification and transparency. This system significantly enhances the reliability and security of financial records.

The application of the triple-entry, facilitated by blockchain technology, introduces a supplementary tier of verification and transparency to financial transactions. This aspect is crucial as it mitigates the risks associated with fraud and errors, thereby enhancing the credibility of financial reporting. Nonetheless, the implementation of such a system encounters obstacles, encompassing technical and regulatory challenges, the necessity for staff training, and the imperative of compatibility with existing systems.

It is noteworthy that blockchain transactions are decentralized, involving all computers in the network and eliminating central points of failure. This characteristic not only increases the difficulty of illicitly altering or deleting official accounts but also diminishes the risk of fraud. The adoption of blockchain technology facilitates the automation of a greater number of transactions, minimizes data loss, enhances transaction tracking capabilities, and improves the identification of user needs throughout the process.

Hence, blockchain technologies exert an impact on the accounting system by augmenting its security and transparency, guaranteeing the precision of records, and automating accounting processes. Nevertheless, they also pose novel challenges for accounting systems, including integration with existing systems and adaptation to regulatory requirements.

In the context of the aforementioned considerations, it is imperative to highlight that the transition to blockchain necessitates ensuring data security and maintaining control over audit trails. Blockchain introduces an additional layer of encryption that safeguards the security of all transactions, establishing an indisputable record of activity, including transaction initiators and timestamps. This construction of an audit trail proves immensely valuable in the face of queries regarding financial records or discrepancies unearthed during an audit. Effectively leveraging these features, coupled with strategies such as employee training, enhances the likelihood of a successful implementation of a new blockchain-based accounting system.

In summary, the integration of digital currencies and blockchain technologies necessitates the formulation of novel accounting standards and regulatory frameworks. This necessity arises from the distinctive properties of these technologies, prompting the need for innovative approaches to accounting, valuation, and reporting. The adaptation to digital currencies and blockchain entails not only technical modifications but also regulatory adjustments to address emerging challenges, such as ensuring security, transparency, and accountability. Simultaneously, these innovations present new prospects for enhancing the efficiency of accounting systems, reducing errors, and bolstering confidence in financial information.

(III) In this section, we aim to encapsulate the contemplation surrounding the concept of formulating a unified accounting standard for cryptocurrencies.

An accounting standard for cryptocurrencies is a comprehensive set of rules and principles dictating the procedures for recording cryptocurrency assets in an organization's accounting records. This standard articulates the methodologies companies should employ for classifying, recognizing, measuring, and reporting transactions involving cryptocurrencies. It encompasses guidance on assessing the fair value of cryptocurrencies, accounting for fluctuations in value, and disclosing pertinent information about these assets in financial statements.

Accounting standards for cryptocurrencies exhibit variation contingent upon the regulatory environment and accounting norms. This variability may encompass international financial reporting standards, employed to standardize accounting practices globally, as well as national accounting standards, which diverge based on the legal stipulations of individual countries. Crucially, each standard considers the distinctive attributes of cryptocurrencies, such as volatility and their digital nature.

From our perspective, a unified accounting standard for cryptocurrencies should adhere to the following stipulations:

1. Delineate whether cryptocurrencies fall under the classification of financial instruments, intangible assets, or another category of assets.
2. Institute principles for recognizing and measuring the value of cryptocurrencies, incorporating the utilization of fair value.

3. Formulate requirements for the disclosure of information on cryptocurrency transactions and the associated risks.
4. Develop requirements for considering the tax implications of cryptocurrency transactions.
5. Implement measures to ensure security and compliance with regulatory requirements about cryptocurrencies.

The envisaged accounting standard for cryptocurrencies, designed to enhance transparency, accounting uniformity, and proficient risk management, introduces notable alterations to conventional approaches to financial accounting. Enhanced transparency, facilitated by detailed disclosure requirements, enables a more profound comprehension and improved evaluation of the risks inherent in cryptocurrencies. The establishment of consistent rules and procedures serves to mitigate disparities in reporting among diverse organizations, thereby ensuring enhanced comparability of data. Standardization in accounting further plays a role in fostering effective financial risk management, particularly in the context of the pronounced volatility characterizing the cryptocurrency market. Additionally, the standard aids organizations in meeting regulatory requirements by affording greater accountability and transparency in financial reporting.

DISCUSSION

In our selected research domain, we can identify several focal points that are currently subjects of active discussions. The first among these is the environmental aspect, applicable to both cryptocurrencies and blockchain technologies at large. As of 2021, Bitcoin's electricity consumption reached a level equivalent to the combined consumption in several U.S. states, prompting initial concerns about governments' ability to decrease reliance on fossil fuels. The substantial surge in mining operations within the US has resulted in heightened strain on energy networks, increased electricity tariffs, and elevated carbon dioxide emissions. Moreover, mining activities often neglect the consideration of energy sources, occasionally resorting to the utilization of economically unviable sources, such as defunct coal or gas plants. Estimates of carbon dioxide emissions from mining activities in the United States from mid-2021 to 2022 indicate a discernible impact on climate change. All of these factors underscore the imperative for a meticulous examination of the environmental dimension concerning cryptocurrencies and blockchain within the context of accounting systems.

Distinct countries and jurisdictions exhibit a lack of precise standards and definitions for cryptocurrencies. Divergent viewpoints prevail, with some categorizing them as commodities, others as currency, and yet others as property. This diversity generates uncertainty and conflicts in the legal standing of cryptocurrencies. It is crucial to emphasize that such ambiguity poses challenges for market participants and investors aspiring for stability and legal lucidity. This state of affairs has the potential to impede the industry's progress and present risks to investments. Consequently, numerous individuals and experts in the field advocate for more coherent and unified rules and definitions for cryptocurrencies at the international level.

The discourse surrounding the establishment of a singular, integrated cryptocurrency accounting system encompasses crucial facets such as privacy protection, international coordination, and technical considerations. On one hand, it is imperative to strike a delicate balance between accounting practices and confidentiality, given the pronounced anonymity inherent in cryptocurrencies. On the other hand, the realization of a unified system necessitates robust international coordination and collaboration among diverse legal and regulatory frameworks. The technical realization of such a system mandates the formulation of standards for data exchange and security. At the core of this discourse lies a nuanced trade-off between the imperative for standardization and the necessity to retain adaptability to accommodate diverse market conditions.

CONCLUSION

In this article, we endeavor to amalgamate a critical analysis of extant research with our observations and recommendations.

A notable advantage of employing blockchain technologies in accounting systems lies in the adoption of triple-entry accounting. Within such a system, beyond the conventional debiting and crediting of accounts, each transaction is also documented on a distributed ledger, such as a blockchain. This entails assigning a unique identifier and a timestamp to each transaction, affording an added layer of verification and transparency. Consequently, this system enhances the reliability and security of financial records.

From our perspective, cryptocurrencies and blockchain technologies present valuable innovations in the realm of accounting, yet concurrently pose specific challenges, particularly concerning standardization and regulation. An integral component of our investigation involves evaluating the environmental facets of cryptocurrency mining, encompassing considerations such as substantial energy consumption and its implications for climate change.

Current accounting systems demand substantial modifications to incorporate cryptocurrencies, necessitating the formulation of new accounting standards. The accounting standard we propose for cryptocurrencies, directed at augmenting transparency, accounting uniformity, and proficient risk management, introduces substantial modifications to conventional financial accounting methodologies. Enhanced transparency, facilitated by detailed disclosure requirements, permits a more profound comprehension and improved evaluation of the risks linked to cryptocurrencies. The establishment of consistent rules and procedures serves to mitigate disparities in reporting across diverse organizations, ensuring enhanced comparability of data. Standardization in accounting further plays a role in fostering effective financial risk management, particularly in the context of the heightened volatility characterizing the cryptocurrency market.

The conducted research successfully analyzed the multifactorial impact of cryptocurrencies and blockchain technologies on the accounting audit system, assessing their role and place in the digital transformation of the economic sphere. During the study, it was established that the development of cryptocurrency and blockchain tools towards automating the collection and processing of information plays a significant role in enhancing the quality and accessibility of financial audit procedures, strengthening the position of digital tools as active participants in modern communicative and informational audit processes.

In future research endeavors, we advocate a concentrated focus on formulating specific recommendations for accounting standards about cryptocurrencies. Additionally, there is a need to explore avenues for mitigating the environmental footprint associated with blockchain technologies. Emphasis should be directed towards the evolution of an international regulatory framework, fostering the standardization and harmonization of accounting practices within the overarching scope of the global digital economy.

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