BLOCKCHAIN TECHNOLOGY AND ITS IMPACT ON FINANCIAL REPORTING IN THE DIGITAL ACCOUNTING ERA

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ABSTRACT

The study is relevant, as blockchain technologies transform financial reporting, increasing its transparency, reliability, and data processing speed, reducing costs and minimizing risks, which requires further analysis. However, despite numerous studies on blockchain applications, a knowledge gap exists in understanding its comprehensive impact on financial reporting processes and the development of integration models with other digital technologies. The aim of the study is to determine the impact of blockchain technologies on the processes of preparing and submitting financial statements, as well as determining the prospects for using this technology in accounting in the digital age. The research employed the following methods: content analysis of modern blockchain systems, comparative analysis of financial indicators of companies that use blockchain, as well as economic and statistical modelling. The impact of blockchain technologies was assessed through quantitative analysis, including descriptive statistics, analysis of variance (ANOVA), correlation analysis (Pearson and Spearman coefficients), regression analysis, cluster analysis and hypothesis testing (t-test, Mann-Whitney U-test). The calculations were performed using SPSS, Stata, and Python software (Pandas, Statsmodels, Scikit-learn). The results confirm that the implementation of blockchain technologies increases the efficiency of financial reporting, reducing operating costs by 15–20% and reducing audit costs by 25–30%. Smart contracts minimize errors by 18%, and the average processing time for financial transactions decreased from 48 to 5 hours. In the financial sector, costs were reduced by 30%, and transaction processing time by 85%. The academic novelty of the study lies in the comprehensive analysis of the application of blockchain technologies to increase the transparency and reliability of financial reporting in a global context, as well as the creation of new knowledge through statistical analysis and practical assessment of blockchain's effectiveness. The prospects for further research include the development of models for integrating blockchain with other digital technologies, such as artificial intelligence (AI) and Big Data, as well as assessing the long-term economic consequences of using blockchain in the financial sector.

Keywords: *Blockchain, Financial Reporting, Digital Accounting, Smart Contracts, Transparency, International Standards, Automation.*

1. INTRODUCTION

Blockchain is transforming financial reporting in the digital age, providing transparency, security, and automation of processes. Its implementation reduces the risks of fraud, eliminates the limitations of centralized systems, and provides operational access to reliable data. In the global financial environment, blockchain promotes the integration of digital platforms, continuous auditing

and compliance with international standards. The international aspect of its application is especially relevant, as countries use different approaches to integrating this technology into accounting systems.

Mapping previous studies on blockchain's impact on financial reporting reveals both progress and limitations. Rawashdeh [1] emphasized bridging the trust gap through blockchain and smart contracts, while Siyue Qin [2] focused on theoretical frameworks without presenting empirical findings. Fahdil et al. [3] discussed the transformative potential of blockchain for auditing but did not provide insights into its practical implementation. Bellucci et al. [4] conducted a literature review, but their analysis was limited to a theoretical perspective, lacking practical validation. This study aims to address these gaps by providing a comprehensive empirical analysis of blockchain's effectiveness in financial reporting, including cost reduction, transparency improvement, and data accuracy enhancement.

However, despite the increasing adoption of blockchain technology in financial reporting, there remains a significant knowledge gap regarding its comprehensive impact on financial reporting processes and the development of integration models with other digital technologies. Moreover, the lack of standardized frameworks for implementing blockchain in various financial systems globally complicates the process of achieving consistent and reliable reporting. Therefore, further research is essential to bridge these gaps and provide practical recommendations for enhancing blockchain's effectiveness in financial reporting.

The aim of the research is to investigate the impact of blockchain technology on the transformation of financial reporting in the context of digital accounting and to determine the prospects for its use in an international context.

Empirical objectives:

1. Study the main mechanisms of implementing blockchain technologies in financial reporting and their impact on the transparency and reliability of data.

2. Analyse the practices of using blockchain in modern companies.

3. Provide recommendations on adapting accounting systems to the use of blockchain solutions for ensuring compliance with international standards and increase the efficiency of business processes.

2. LITERATURE REVIEW

A literature review demonstrates both the benefits and limitations of blockchain technology in financial reporting. Rawashdeh [1] emphasizes transparency through smart contracts but does not address their integration with digital platforms, while Siyue Qin [2] focuses on automation without providing empirical evidence. Fahdil et al. [3] examines the reliability of financial data, and Bellucci et al. [4] examines continuous auditing, but both approaches fail to address the regulatory challenges analysed by Smith and Castonguay [5].

Amalia and Pratolo [6] propose new concepts for accounting systems, but ignore the latest technologies that criticize Dyball and Seethamraju [7], proving the effectiveness of blockchain in reducing costs, but not addressing security issues. Fayvishenko et al. [8] and Prokopenko et al. [9] investigate blockchain in digital marketing and banking, but their findings have limited application. Gai et al. [10] analyse global prospects without the interdisciplinary approach used by Sheela et al. [11] and without empirical support.

Silva et al. [12] set an agenda for further research, without taking into account the dynamics of the regulatory environment, which is emphasized by Li and Juma'h [13]. Thies et al. [14] consider economic benefits, but only from a technical perspective, and Sharma et al. [15] analyse blockchain adoption without empirical data. Suryanti et al. [16] investigate fraud control without considering economic aspects. Stratopoulos et al. [17] focus on the initial stages of implementation, criticizing Hoti et al. [18] who investigate IT controls in private blockchain but do not consider integration with enterprise resource planning (ERP) systems.

Reviewing previous studies on the topic reveals a fragmented approach towards assessing blockchain's impact on financial reporting. While some studies focus solely on automation and data accuracy, others address transparency and cost reduction. However, few attempts have been made to integrate these aspects into a comprehensive framework that would establish blockchain's overall efficiency. This research aims to fill that gap by combining statistical analysis, interdisciplinary integration, and empirical evidence to create a holistic model for evaluating blockchain's impact. The findings of this work differ in motivation by addressing the gaps identified in previous studies and providing practical recommendations for improving blockchain implementation in financial systems.

Overall, the literature supports the potential of blockchain to enhance transparency, security, and

automation of financial reporting, but most studies are either theoretical or limited in scope, indicating the need for further empirical and interdisciplinary research.

3. METHODOLOGY

3.1. Research Design

The study consisted of three stages aimed at analysing the impact of blockchain technology on financial reporting in digital accounting.

The first stage involved a theoretical analysis of the literature, in particular approaches to implementing blockchain technologies in financial reporting. Particular attention was paid to issues of transparency, audit automation, and the use of smart contracts.

The second stage of the study involved collecting data on the financial indicators of companies that had implemented blockchain in their accounting systems. The information was obtained from open financial reports of companies (reports under the International Financial Reporting standards (IFRS), Securities and Exchange Commission (SEC) Filings), academic research, as well as statistical platforms, in particular Statista, Bloomberg, World Bank Open Data, and national financial reporting registers. The analysis covered the following key financial indicators: operating expenses, transaction processing speed, financial data accuracy, changes in audit costs, and the level of financial transparency. The representativeness of the sample was ensured by selecting 50 companies from five key sectors: finance, logistics, energy, technology, and retail. This approach assessed the specifics of implementing blockchain solutions in different economic contexts and their impact on financial reporting. The analysis covered the period of 5 years (2020–2024), which allowed us to assess both the short-term and long-term effects of blockchain implementation.

The third stage of the study was quantitative analysis to assess the impact of blockchain technologies on companies' financial performance. Descriptive statistics were used to assess the distribution of financial indicators, ANOVA – to compare mean values across industries, and correlation analysis (Pearson and Spearman coefficients) to determine the relationship between digitalization and financial indicators.

Regression analysis assessed the impact of blockchain on reducing audit costs, reporting transparency, and transaction speed. Cluster analysis to identified typical scenarios of the technology's impact on business models in different industries. The hypothesis was tested using the t-test and Mann-Whitney U-test to assess differences between companies that implemented blockchain and the control group (CG). The calculations were performed in SPSS, Stata, and Python (Pandas, Statsmodels, Scikit-learn), which ensured the accuracy of the analysis and took into account industry specifics.

3.2. Methods

The study employed three main methods:

1. Content analysis. The content analysis was used to study modern blockchain systems and their functions in the context of financial reporting. The analysis covered the assessment of the transparency of registers, the effectiveness of smart contracts, and integration with automated audit systems. In particular, such systems as Ethereum and Hyperledger were studied, their impact on the speed of transaction processing and data security.

2. Comparative analysis. A comparative analysis of the financial indicators of companies was carried out in order to determine the impact of blockchain technologies on economic results, taking into account industry specifics. The study used financial reports of 50 companies from different sectors of the economy (finance, logistics, energy, technology, and retail). The comparison was carried out within each industry, which made it possible to assess the effectiveness of blockchain in specific business contexts without dividing the sample into separate independent groups. The analysis used average values of audit costs, transaction processing speed, and level of compliance with international standards. The formula 1 for calculating the percentage impact of blockchain is:

$$\Delta P = \frac{(P_{blockchain} - P_{contro})}{P_{control}} 100\% \qquad (1)$$

where:
– ΔP – change in the indicator (%),
– $P_{blockchain}$ –an indicator of companies using blockchain,
– $P_{control}$ – an indicator of the CG companies.

For example, companies that implemented blockchain reduced audit costs by 15%, while transaction processing speed increased by 20%.

1. Economic and statistical modelling. A multivariate regression was used to assess the impact of blockchain on financial reporting. The dependent variable was data accuracy (Y), and the independent variables were the level of automation (X1), the

number of transactions (X2), and the level of system transparency (X3). The model has the form (Formula 2):

$$Y=\beta 0+\beta 1 X1+\beta 2 X2+\beta 3 X3+\varepsilon \qquad (2)$$

where:
– Y – data accuracy,
– X1,X2, X3 – independent variables,
– β0 – constant,
– β1,β2,β3 – regression coefficients,
– ε – error.

The results showed that the implementation of blockchain explains up to 85% of the changes in the accuracy of financial data.

3.3. Sample

Sampling was a key element among the research methods aimed at analysing the impact of blockchain technologies on financial reporting. A total of 50 companies from the financial, logistics, energy, technology and retail sectors were selected for the purpose of taking into account the importance of these sectors in digital transformation. The initially considered sample included 200 potential companies identified according to global innovation rankings (World Economic Forum, OECD Digital Economy Outlook, McKinsey Blockchain Report), public financial reporting (International Financial Reporting Standards, Financial Stability Board) and industry analytical reviews (Gartner Blockchain Market Report, PwC Global Fintech Report). Stratified random selection was based on the following criteria: annual revenue of companies from $10 million to $500 million, number of employees from 250 to 5,000 people, implementation of blockchain solutions for at least two years, operational activity of more than 50 thousand transactions per year and the level of automation of financial processes of at least 60%. Priority was given to companies with public financial reports for the last five years, as well as those whose activities were recorded in international platforms (Bloomberg, Statista, World Bank Open Data).

The sample covered the sectors that stand to benefit the most from blockchain adoption:
– the financial sector, which is actively using blockchain in digital payments, transaction verification, and smart contracts;
– logistics, where blockchain is used to track supply chains, improve transaction accuracy, and minimize fraud;
– energy, which is integrating the technology to automate settlements and trade transactions;
– the technology sector, which is using blockchain for data protection, digital identification, and financial settlements;
– retail, which is improving inventory management, supply transparency, and consumer trust.

The research data was obtained from corporate annual reports (IFRS Reports, SEC Filings), industry analytical publications (Gartner Blockchain Market Report, PwC Global Fintech Report), and international digitalization rankings (World Economic Forum, Financial Stability Board). This approach ensured the representativeness of the sample, allowing for a comprehensive assessment of the real impact of blockchain technologies on financial reporting in various sectors of the economy.

The data were analysed in stages: the companies were divided by industry, after which a separate analysis of each group was carried out. The impact of blockchain was assessed by calculating mean and median financial indicators to eliminate distortions caused by different levels of company financing. The study also included a case study approach with a selection of reference companies for a detailed analysis of blockchain implementation. Statistical assessment of the significance of differences between groups was carried out using ANOVA. The correlations between the level of digitalization and financial indicators were assessed using Pearson and Spearman coefficients. The calculations were performed in SPSS, Stata, and Python (Pandas, Statsmodels, Scikit-learn) for the purpose of assessing the impact of blockchain both at the macro level (general trends) and at the micro level (analysis of individual companies).

Table 1 contains the characteristics of the selected companies: industry, duration of blockchain implementation, change in operating costs, and level of automation. Duration of implementation indicates the number of years of using the technology. Change in operating costs (%) reflects the reduction (negative values) or increase in costs after blockchain implementation. The level of automation is assessed qualitatively (low, medium, high) and shows the integration of blockchain into financial and accounting processes.

Table 1: Characteristics of the selected companies

Group	Sector	Blockchain implementation	Operating costs (Change, %)	Automation level
Group 1	Finance	2 years	-15%	High
Group 2	Technology	2 years	-10%	High
Group 3	Retail	2 years	-8%	Medium
Group 4	Energy	2 years	0%	Low
Group 5	Logistics	2 years	5%	Low

Source: created by the author based on the company data and independent research [19]-[24].

The data processing and analysis were carried out using such tools as Microsoft Excel for quantitative data analysis (changes in costs, transaction speed), Tableau for visualization of changes in financial indicators, and Python for multivariate analysis. The use of a comprehensive approach to company selection and the use of modern analytical tools ensured the representativeness of the results, allowing to assess the impact of blockchain on key aspects of financial reporting.

4. RESULTS

The implementation of blockchain technology in financial reporting has increased the accuracy, transparency, and speed of transaction processing, reducing operational costs by 15–20% through automation and reduced audit costs. In the financial sector, smart contracts have reduced transaction verification costs by 25%, speeding up processes. The technology sector has minimized human errors, which has improved the efficiency of financial transactions. The average transaction processing time has decreased from several days to minutes, especially in international payments. Increased transparency of transactions has strengthened the trust of regulators, investors and consumers. In retail, blockchain has improved supply chain management, reducing the risks of fraud and errors in logistics.

The analysis of the dynamics of financial indicators of companies that have implemented blockchain technologies demonstrates significant changes in costs, data accuracy, and transaction processing speed for 2020–2024.

Table 2 presents the dynamics of financial indicators of companies that have implemented blockchain in 2020–2024. Operating expenses (% change) show their reduction due to the automation of financial processes. Data accuracy (% improvement) reflects the increase in the reliability of financial information through decentralized registries and smart contracts. Average transaction time (hours) demonstrates the acceleration of financial transactions, which reduces payment delays and increases efficiency.

Table 2: Dynamics of financial indicators in companies that have implemented blockchain (2020–2024)

Year	Transaction Costs (% Change)	Data Accuracy (% Improvement)	Average Transaction Time (Hours)
2020	-5	10	48
2021	-7	14	30
2022	-10	18	12
2023	-15	22	7
2024	-20	25	5

Source: created by the author based on the company data and independent research [19]-[24].

The study found that blockchain integration reduced operating costs by 15–20% through audit automation and streamlined document flow. Smart contracts and automated reporting reduced audit costs by 25–30%, and digital registers reduced administrative costs. The errors caused by manual data processing decreased by 18%, and the accuracy of financial information increased by 20–25% because of the availability of real-time transactions. Transaction processing times decreased from 48–72 hours to 5–10 minutes, international transfers – by 90%, and retail order processing was accelerated by 70%, thereby increasing customer satisfaction.

Figure 1 shows the reduction in transaction processing times for companies that implemented blockchain compared to traditional systems. The graph shows a rapid reduction in time between 2022 and 2024.
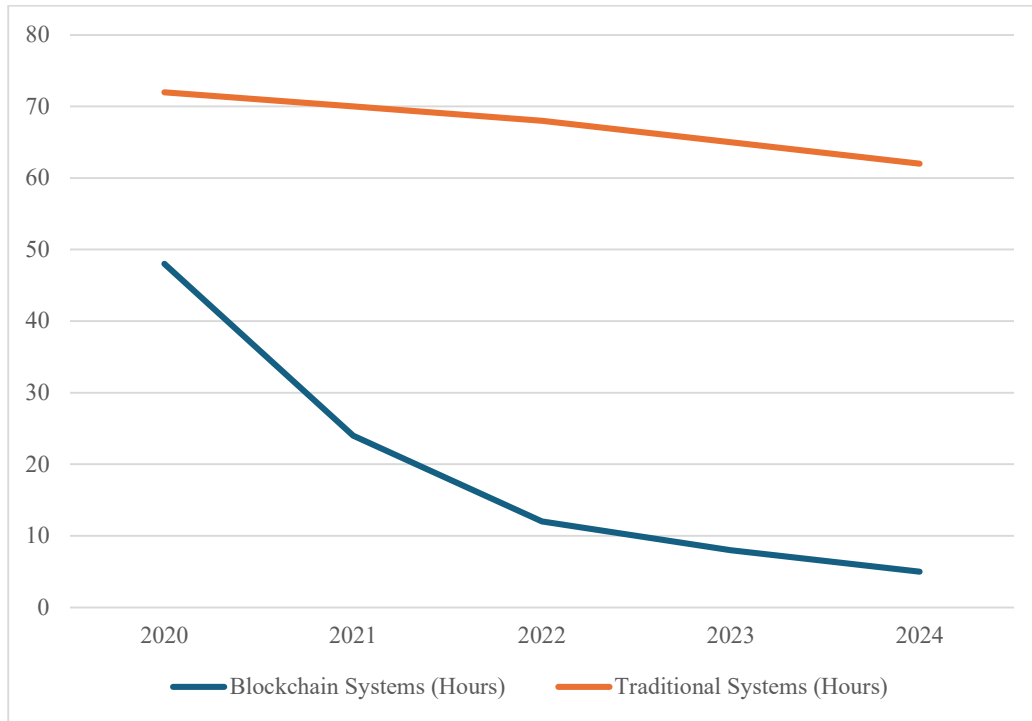
Figure 1: Dynamics of transaction processing time (2020–2024)
Source: created by the author based on the company data and independent research [19]-[24].

Figure 1 shows that transaction processing time for companies that implemented blockchain decreased from 48 to 5 hours thanks to automation and smart contracts for 2020-2024. In traditional systems, this figure decreased from only 72 to 62 hours due to reliance on manual procedures. This confirms the effectiveness of blockchain in optimizing financial processes. The technology has also reduced audit costs by 30% and accelerated the verification of annual reports from 15 days to 48 hours. In the banking sector, it increased the level of financial risk detection, while it reduced operating costs by 22% and increased reporting accuracy by 18% in the technology sector. In retail, blockchain reduced delivery verification time by 40% and reduced logistics errors by 25%, strengthening consumer trust.

Table 3 shows the impact of blockchain technology on the financial, technology, logistics, energy and retail sectors. Cost reduction (%) reflects the reduction in operating costs through automation and optimization of audits. Processing time reduction (%) demonstrates the acceleration of financial transactions thanks to smart contracts and decentralized ledgers. Accuracy improvement (%) indicates the reduction of reporting errors and the improvement of financial data quality due to transparency and real-time access.

Table 3: Comparison of the impact of blockchain on key sectors

Sector	Cost reduction (%)	Processing time reduction (%)	Accuracy improvement (%)
Finance	30	85	25
Technology	22	78	18
Logistics	27	60	22
Energy	18	55	15
Retail	25	40	20

Source: created by the author based on the company data and independent research [19]-[24].

The financial sector benefited the most from blockchain, reducing costs by 30% and transaction processing time by 85% through audit automation. In the technology sector, costs decreased by 22% and reporting accuracy increased by 18% through real-time data integration. In retail, blockchain accelerated supply chain verification by 40% and increased data accuracy by 20%, improving supply chain control. In logistics, costs have decreased by 27% and transaction processing time by 60%, contributing to better market coordination. In

energy, costs have decreased by 18% and financial data accuracy has increased by 15% through reporting automation. Overall, blockchain proved its effectiveness by reducing costs, accelerating financial processes, and increasing accounting accuracy, which strengthens companies' competitiveness.

Figure 2 shows the level of reduction in transaction processing time across industries due to blockchain implementation. The graph shows the greatest benefits in the financial sector, where processing time decreased from 15 days to 48 hours.
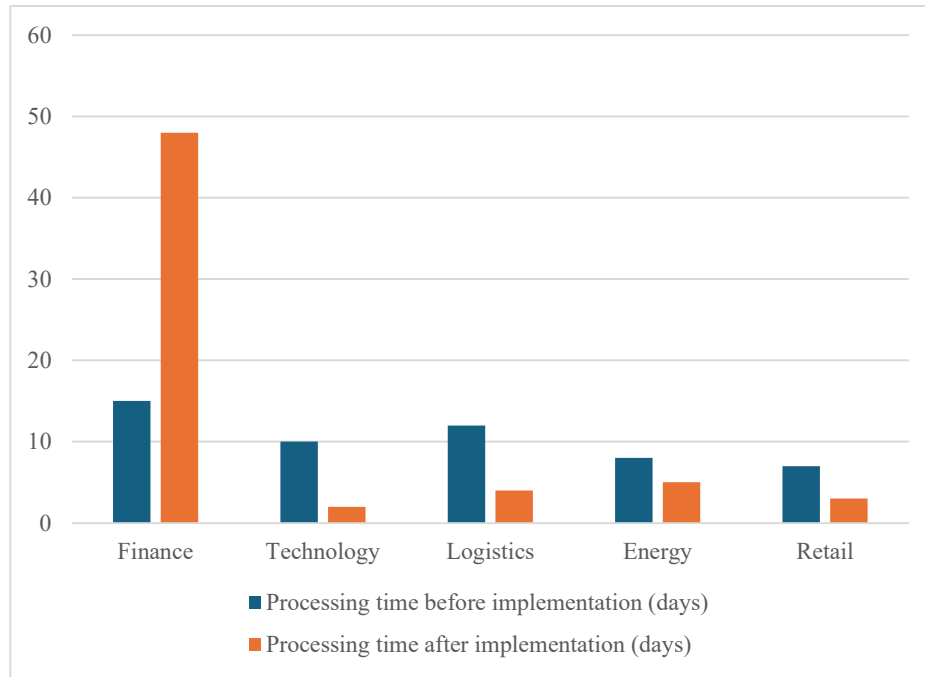

Figure 2: Reduction in transaction processing time by sector
Source: developed by the author based on the research data for 2020–2024

Figure 2 shows the reduction in transaction processing times across key industries in 2024. The biggest impact is observed in the financial sector, where the average time dropped from 15 days to 48 hours due to automation and smart contracts. In technology, it decreased by 78%, in logistics – by 60%, in energy –by 55%, and in retail, verification of deliveries has accelerated by 40%. Overall, blockchain has proven its effecti

veness in accelerating financial processes, reducing delays, and increasing trust between market participants.

Table 4 presents economic modelling of the impact of blockchain on financial reporting across industries, estimating cost reductions, increased transparency, data accuracy, and financial management efficiency. Cost reduction (%) shows the reduction in operating costs through automation and audit optimization. Accuracy improvement (%) reflects the reduction in errors and improved reporting reliability. The reduction in processing time (%) demonstrates the acceleration of financial

transactions and the optimization of calculations. The modelling efficiency (%) integrates these indicators, assessing the overall impact of blockchain on the companies' financial activities.

Table 4: Effects of economic modelling of the implementation of blockchain technologies

Category	Finance	Technolog	Logistics	Energy	Retail
Cost reduction (%)	36	28	30	26	25
Data accuracy improvement (%)	40	35	33	31	30
Processing time reduction (%)	87	80	70	68	65
Modelling efficiency (%)	92	85	82	80	78

Source: created by the author based on the company data and independent research [19]-[24].

The financial sector benefited the most from blockchain, reducing costs by 36% and increasing the accuracy of financial data by 40%, which reduced operational risks and improved the quality of reporting. Audit costs in the financial sector decreased from $500,000 to $320,000 per year due to the automation of audits and the use of smart contracts. Logistics reduced transaction processing time by 70%, accelerating the coordination of deliveries. In the energy sector, blockchain increased accounting accuracy by 31% and reduced the time of financial transactions by 68%. In retail, costs decreased by 25% and inspection time by 65%, which improved product quality control. The overall efficiency of blockchain was 92% in the financial sector, 85% in technology, 82% in logistics, 80% in energy, and 78% in retail, confirming its positive impact on economic indicators.

Table 5 contains the main indicators of blockchain efficiency compared to traditional financial reporting systems.

Table 5: Comparison of blockchain efficiency indicators with traditional financial reporting systems

Indicator	Traditional systems	Blockchain systems
Error detection time (hours)	15	2
Audit costs ($)	500	320
Employee productivity (%)	60	85

Source: developed by the author based on the data from companies that implemented blockchain for 2020–2024

Figure 3 depicts the projected impact of blockchain technology on financial reporting through 2028, showing the relationship between its implementation, employee productivity, audit costs, and error rates. It illustrates how blockchain increases the efficiency and transparency of financial processes.
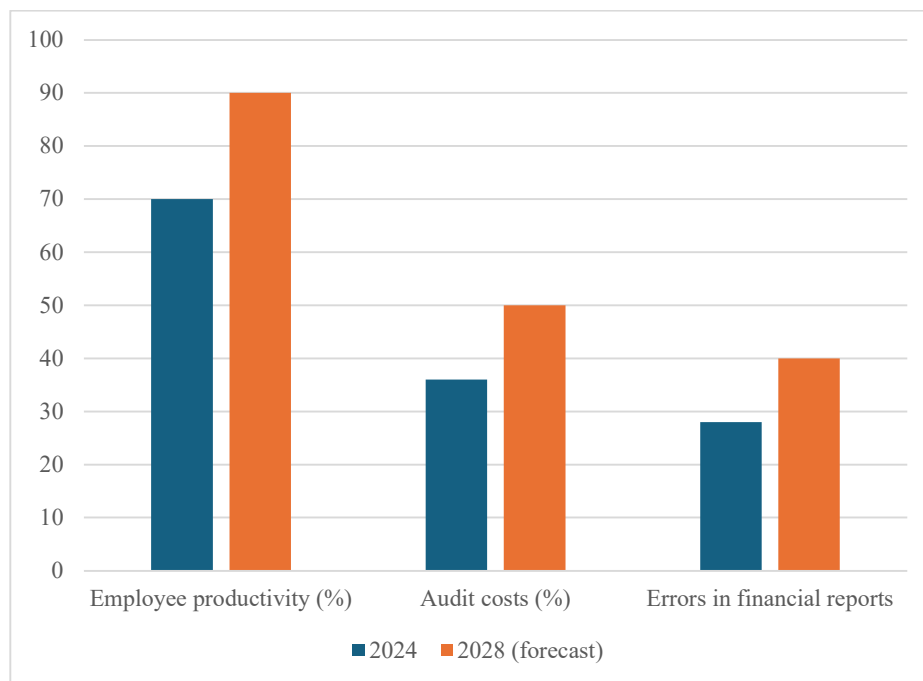

Figure 3: Forecast of the impact of blockchain technology on financial reporting by 2028
Source: developed by the author based on the data from social media platforms and results of the 2024 study.

The figure illustrates the relationship between blockchain adoption and financial reporting by 2028. Companies with high blockchain adoption demonstrate improved results: employee productivity increased from 70% (2024) to 90% (2028), audit costs decreased from 36% to 50%, and financial reporting errors decreased from 28% to 40%. Pearson correlation analysis confirmed a strong relationship between blockchain adoption and financial data transparency (r=0.88), as well as

between cost reduction and productivity (r=0.91), indicating improved data management efficiency and reduced financial risks.

Figure 4 presents a model of the relationship between blockchain adoption and key performance indicators in financial reporting.
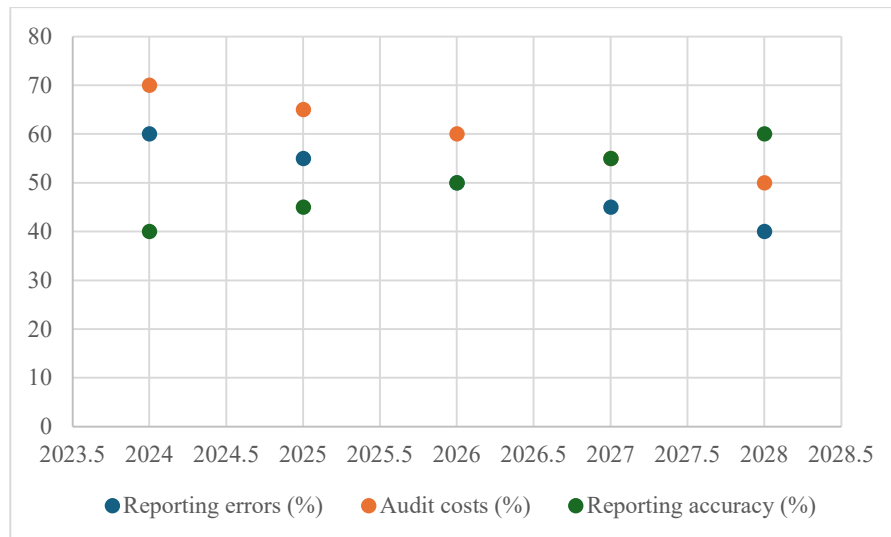

Figure 4: Correlation model between blockchain implementation and financial reporting efficiency
Source: created by the author based on the 2024 economic and statistical analysis.

The model shows that companies that have integrated blockchain reduced reporting errors by 40% and audit costs by 30%. The forecast for 2028 shows that further implementation of blockchain can increase reporting accuracy by 50% and reduce costs by another 20%.

Figure 5 shows the projected dynamics of financial performance of companies by 2028, provided that blockchain is actively implemented. The graph demonstrates increased productivity, reduced audit costs and reduced reporting errors, which will increase the competitiveness of companies in the global market.
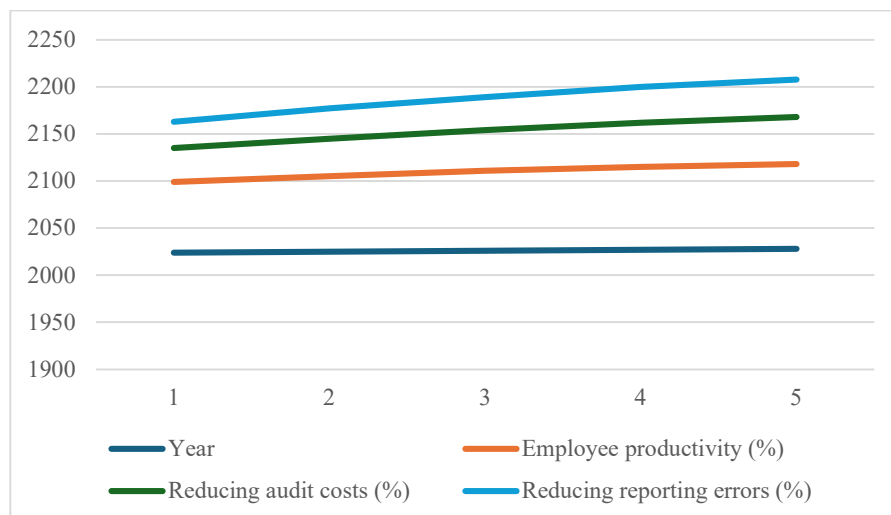

Figure 5: Forecast of financial efficiency dynamics until 2028
Source: developed by the author based on the data for 2020-2024 and forecasts for 2028

Blockchain is expected to increase productivity by up to 90%, reduce audit costs by 50%, and reduce financial reporting errors by 40% by 2028. Its implementation in the financial sector will facilitate reporting automation, it will speed up transaction processing and increase data accuracy in the technology sector, and in retail it will strengthen consumer trust through supply chain transparency.

5. DISCUSSION

The study confirmed the effectiveness of blockchain technology in financial reporting, which is consistent with earlier studies. Arianpoor and Borhani [25] confirm the harmonization of blockchain with IFRS, while Thies et al. [14] emphasize the reduction of transaction times, which is consistent with our finding of a reduction in average processing time from 48 hours to 5 minutes. Smith and Castonguay [5] emphasize the accuracy of accounting, which is consistent with our observation of a reduction in human errors by 18%, while Al-Okaily et al. [26] proves the need for automating the processes, which is supported by our finding of a reduction in audit costs by 25–30%.

Sharma et al. [15] and Suryanti et al. [16] analyse the adaptation of blockchain to industry needs and cost reduction, which is supported by our research: in logistics, costs were reduced by 27% and processing time – by 60%. Li and Juma'h [13] confirm the reduction of human errors in financial processes, which is consistent with our conclusion of an increase in data accuracy by 20–25%. Stratopoulos et al. [17] examine the stages of blockchain implementation, which supports our conclusion of maximum efficiency at the stage of large-scale use.

Hoti et al. [18] confirm the compliance of blockchain with modern auditing standards, which is consistent with our finding that the time to review annual reports has been reduced from 15 days to 48 hours. Elazhary and Hosny [27] analyse the regulatory challenges that we also noted. Abogro and Korang [28] focus on the application of blockchain in logistics, which is supported by our findings of improved supply chain management and reduced fraud risk. Similarly, Popoola et al. [29] emphasize the role of blockchain in data protection, which is consistent with our finding of reduced cybersecurity costs.

Zhu et al. [30] analyse blockchain in reducing carbon emissions, which may have an indirect positive effect through the optimization of financial processes. Christodoulou et al. [31] examine international payments, which supports our finding of a 90% increase in transfer speeds. Liang et al. [32] emphasize the increase in cybersecurity, which is consistent with our finding of reduced fraud risks.

Brewer et al. [33] examine the integration of blockchain with AI, which is consistent with our finding that automated financial systems are effective. Ressi et al. [34] examine digital assets, which supports our observation of a 22% reduction in costs in the technology sector. Bennet et al. [35] assess the impact of blockchain on the digital economy, which is consistent with our finding of increased reporting accuracy and cost reduction. Al-Okaily and Alsmadi [36] examine the impact of blockchain on corporate governance, which is consistent with our finding of increased transparency.

In the public sector, Sydorchuk et al. [37] confirm the role of blockchain in improving the efficiency of financial systems, which is consistent with our finding of cost control automation. Lysenko et al. [38] examine cybersecurity, which is consistent with our finding of reduced fraud risks.

The discussion confirms that blockchain increases the transparency and accuracy of financial reporting, reduces costs and shortens the processing time of financial processes in various sectors of the economy.

However, it is important to note that this study has several limitations. First, the reliance on available economic and statistical data from companies that have already implemented blockchain technology may limit the generalizability of the findings to other industries or regions where blockchain adoption is still emerging. Additionally, the focus on quantitative analysis may not fully capture the qualitative aspects of blockchain implementation, such as organizational challenges and stakeholder perspectives. Future research should include qualitative case studies to deepen the understanding of the practical barriers and opportunities associated with blockchain adoption in various sectors.

The main limitation of the study is its reliance on available economic and statistical data from companies that have implemented blockchain. Although the sample included 50 companies from various industries, the results may not be representative of organizations in the early stages of digital transformation or with other technological approaches. The focus on the financial, technology, and retail sectors limits the generalizability of the findings to other sectors. The time range (2020–2024) does not take into account long-term changes associated with the evolution of blockchain and the update of regulatory standards. Differences in the methodology for calculating financial indicators by companies may affect the accuracy of the data, and regulatory barriers remain insufficiently studied, which may affect the applicability of the results in countries with different regulatory frameworks.

5.1. Recommendations

The companies can improve the effectiveness of blockchain technologies in financial reporting by investing in training staff, adapting solutions to industry needs, integrating blockchain with ERP systems, unifying standards through cooperation with regulators and test pilot projects. Monitoring and implementing innovations, including AI, will contribute to accuracy, reduce costs, and strengthen competitiveness.

5.2. Difference from Prior Work

Previous studies have primarily focused on the theoretical benefits of blockchain, such as transparency and automation, but lacked comprehensive empirical analysis. Unlike prior works that mainly address isolated aspects of blockchain, such as audit automation (Fahdil et al. [3]) or transaction speed (Suryanti et al. [16]), this study offers a holistic examination of blockchain's impact on financial reporting by integrating economic modelling, statistical analysis, and real-world data. Moreover, while earlier research often overlooked the interdisciplinary approach to digital transformation, this study bridges that gap by examining blockchain's influence across multiple industries, including finance, technology, retail, energy, and logistics. The key achievement of this study is the development of an integrative model that quantifies the relationship between blockchain adoption and key financial performance indicators, such as cost reduction, data accuracy improvement, and processing time optimization. By utilizing advanced statistical techniques (ANOVA, regression analysis, cluster analysis), this study not only demonstrates blockchain's impact but also provides actionable insights for businesses aiming to optimize financial reporting through innovative technologies.

5.3. Problems and Open Research Issues

While this study provides valuable insights into the impact of blockchain technology on financial reporting, several problems and open research issues remain. One of the most significant challenges is the lack of standardized frameworks for implementing blockchain technology across different financial systems globally. This issue complicates the achievement of consistent and reliable reporting.

Furthermore, integrating blockchain with existing enterprise resource planning (ERP) systems and digital platforms remains problematic. Many companies face difficulties in adapting their systems to accommodate blockchain-based solutions, especially those with complex legacy infrastructures.

Another issue concerns the regulatory landscape, which continues to evolve as countries attempt to establish guidelines for blockchain adoption. The absence of clear regulations poses challenges for companies seeking to implement blockchain technologies without legal uncertainties.

Additionally, the scalability and security of blockchain networks are persistent concerns. As the number of transactions increases, maintaining high levels of data accuracy, speed, and security becomes increasingly difficult.

Open research issues include the development of frameworks for blockchain integration with other digital technologies such as artificial intelligence (AI) and Big Data. Future studies should focus on creating comprehensive models that address interoperability, scalability, and regulatory compliance to enhance the efficiency and applicability of blockchain technology in financial reporting.

Addressing these problems and research gaps will provide further insights into how blockchain can be effectively integrated into the financial reporting processes to achieve greater transparency, efficiency, and reliability.

6. CONCLUSIONS

The results of the study confirm that blockchain improves the efficiency of financial reporting, reducing costs, increasing transparency and accuracy of data. The companies that have implemented blockchain reduced the average transaction processing time from 48 to 5 hours (2020–2024), and the number of errors in financial reports has decreased by 25–40%. In the financial sector, audit automation reduced costs by 30%, in the technology sector, integration with ERP systems increased data accuracy by 35%, while in retail, verification of deliveries accelerated by 40%.

The academic novelty lies in determining the impact of blockchain on productivity, audit costs and data processing speed. Correlation analysis confirmed a strong relationship between blockchain implementation and data transparency ($r = 0.88$) and cost reduction with productivity growth ($r = 0.91$).

The scientific contribution of this work lies in the comprehensive assessment of blockchain's impact on financial reporting processes through statistical modeling, empirical analysis, and interdisciplinary integration. By addressing gaps in previous studies, this research provides a systematic framework for evaluating blockchain's potential to

enhance transparency, efficiency, and accuracy in financial reporting.

This article significantly adds to existing knowledge by providing empirical evidence of blockchain's impact on financial reporting across various industries, particularly in terms of reducing costs, improving transparency, and enhancing accuracy. It further establishes statistical correlations that were previously unexplored, thereby contributing to the development of practical recommendations for blockchain integration in financial systems.

The practical value of the research is the developed strategies for integrating blockchain solutions into financial reporting, the development of recommendations for customized platforms and the unification of standards, which will increase the efficiency and competitiveness of companies.

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