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EVALUATING THE EFFECTIVENESS OF BLOCK CHAIN ACCOUNTING IN CURBING FINANCIAL LOSSES IN THE HEALTH SECTOR

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ABSTRACT : This study assesses the effectiveness of blockchain accounting in mitigating financial losses in the health industry, with an emphasis on eliminating fraudulent financial transactions, minimizing billing mistakes, improving financial reporting efficiency, and increasing openness and accountability. Financial losses from fraud, inefficiency, and poor record keeping continue to be serious concerns in healthcare across the world. Blockchain technology, with its decentralized, immutable ledger and smart contract capabilities, presents a viable answer to these problems. Data were obtained from hospital financial managers and analyzed using multiple regression to determine the association between blockchain accounting and financial loss reduction. The findings show that blockchain accounting minimizes fraud and duplicate payments, simplifies financial reporting, and improves financial transparency in healthcare institutions. However, impediments to wider adoption include interaction with existing systems, regulatory uncertainty, and opposition owing to a lack of technical experience. These findings are consistent with prior empirical research and highlight the need for comprehensive policy frameworks, capacity-building programs, and infrastructural expenditures to facilitate efficient blockchain adoption. The study adds to knowledge by addressing gaps in understanding of socio-technical problems and regulatory impediments to blockchain implementation, as well as advocating for uniform assessment criteria and longitudinal research in a variety of healthcare situations. The findings have practical significance for hospital administrators, regulators, and researchers looking for novel approaches to improving financial governance and accountability. Finally, this study recommends blockchain accounting as a revolutionary instrument for reducing financial losses and increasing resource utilization in the global health industry.

KEYWORDS: *Blockchain Accounting, Financial Losses, Healthcare Finance, Fraud Reduction, Financial Transparency*

I. INTRODUCTION

1.1 Background of the Study

The use of blockchain accounting into the healthcare sector has garnered traction as a potential solution to ongoing financial inefficiencies and losses. The worldwide health business confronts significant financial resource management issues owing to fraud, billing disparities, administrative waste, and a lack of data accuracy. According to recent research, financial mismanagement, which is typically caused by antiquated accounting systems and scattered data networks, costs billions of dollars each year (WHO, 2022). Traditional centralized accounting procedures are frequently susceptible to manipulation and cyber attacks, highlighting the need for more secure and transparent alternatives. Blockchain accounting provides a decentralized, tamper-proof ledger for recording financial transactions in real time, enhancing accountability while lowering the danger of fraud and data manipulation (Alketbi et al., 2021).

Blockchain's capacity to assure data immutability and its use of consensus processes give a solid platform for safe financial operations. In healthcare, smart contracts incorporated in blockchain systems can automate financial procedures such as insurance claims, reimbursements, and supplier payments, reducing human error and increasing operational efficiency (Wang et al., 2023). These qualities are especially important in an environment where late payments and administrative difficulties might jeopardize service delivery. Furthermore, blockchain technology promotes interoperability among stakeholders—hospitals, insurers, and regulators—allowing them to access consistent financial information while reducing duplication of work (Chen et al., 2024).

Recent pilot programs in technologically advanced countries have shown considerable reductions in fraudulent billing and increased financial transparency following the implementation of blockchain-based systems. For example, blockchain technologies adopted in various European health networks have provided real-time audits

and rapid financial reconciliation, easing budgeting and compliance (Rahman & Chowdhury, 2023). Despite these hopeful improvements, the implementation of blockchain accounting is still in its early stages, with scalability, regulatory approval, and interface with legacy systems remaining obstacles. Nonetheless, its potential to redefine accountability and economic responsibility in the health sector is significant. This study aims to determine how successfully blockchain accounting may reduce financial losses in healthcare by offering empirical insights into its ability to modify traditional accounting processes and support long-term financial health management.

1.2 Statement of the Problem

Despite substantial advances in digital health systems, financial inefficiencies and fraud continue to be major concerns in the healthcare industry. Inflated billing, duplicate payments, data breaches, and a lack of transparency in financial operations all lead to significant worldwide financial losses. According to the World Health Organization (2022), inefficiencies and corruption cause a large part of healthcare funding to be lost—up to 20% in some places. Traditional accounting systems, which are frequently centralized and susceptible to manipulation, lack the scalability necessary to assure real-time verification, security, and integrity of financial transactions. While several technical interventions have been proposed, many fail to create a fully transparent and tamper-proof environment, emphasizing the need for more creative financial governance solutions (Chen et al., 2024).

Blockchain accounting, with its decentralized and immutable ledger capabilities, has been offered as a feasible alternative. However, empirical data confirming its usefulness in the healthcare environment is still scarce. Most recent research focus on blockchain's technological benefits or its application in clinical data management, rather than its financial applications (Alketbi et al., 2021). Furthermore, there is a scarcity of thorough studies examining how blockchain accounting affects cost savings, fraud reduction, and process efficiency in real-world healthcare systems. The restricted scope of existing literature sometimes ignores contextual issues such as legal limits, interoperability problems, and organizational preparedness for technological change (Rahman & Chowdhury, 2023).

Another critical research gap concerns the scalability and long-term viability of blockchain systems in complex healthcare environments. While pilot programs have demonstrated promising outcomes, they are frequently small-scale and constrained to specific geographic or administrative situations, failing to provide a generalizable framework for broader application (Wang et al., 2023). Furthermore, the costs of adopting and maintaining blockchain infrastructure are understudied, particularly in underdeveloped nations where financial restrictions are more prominent.

This study fills these gaps by rigorously examining the effectiveness of blockchain accounting in reducing financial losses in the healthcare sector. Its goal is to give data-driven insights into how blockchain might improve financial accountability and integrity, eventually facilitating informed policymaking and investment in healthcare technology.

1.3 Aim and Objectives of the Study

The aim of this study is to evaluate the effectiveness of blockchain accounting in curbing financial losses in the health sector. Other specific objectives are:

1. To assess the impact of blockchain accounting on reducing fraudulent financial transactions in the health sector.
2. To examine the effect of blockchain accounting on minimizing billing errors and duplicate payments in healthcare organizations.
3. To evaluate how blockchain accounting influences the efficiency of financial reporting processes in the health sector.
4. To determine the role of blockchain accounting in enhancing financial transparency and accountability in healthcare institutions.

1.4 Research Questions

The study provides answers to the following research questions:

1. How does blockchain accounting reduce fraudulent financial transactions in the health sector?
2. In what ways does blockchain accounting minimize billing errors and duplicate payments in healthcare organizations?
3. How does the implementation of blockchain accounting affect the efficiency of financial reporting processes in the health sector?
4. To what extent does blockchain accounting enhance financial transparency and accountability in healthcare institutions?

1.5 Research Hypotheses

The study is guided with the following null hypotheses:

1. H_{01}: Blockchain accounting has no significant effect on the reduction of fraudulent financial transactions in the health sector.
2. H_{02}: Blockchain accounting does not significantly reduce billing errors and duplicate payments in healthcare organizations.
3. H_{03}: Blockchain accounting has no significant impact on the efficiency of financial reporting processes in the health sector.
4. H_{04}: Blockchain accounting does not significantly enhance financial transparency and accountability in healthcare institutions.

1.6 Significance of the Study

The relevance of this study stems from its ability to give practical insights into how blockchain accounting might address ongoing financial inefficiencies in the health industry. With rising healthcare expenses and an increase in financial mismanagement, there is an urgent need for creative solutions that promote transparency, minimize fraud, and improve accountability. This study adds to the expanding body of information on digital financial technologies and their use in healthcare by assessing the efficacy of blockchain accounting.

For hospital administrators and politicians, the findings may provide a data-driven framework for making educated decisions on the use of blockchain-based accounting systems. Improved financial integrity can lead to improved resource allocation, which improves service delivery and patient outcomes. For technology developers and system integrators, the report suggests particular areas where blockchain might be maximized for healthcare accounting reasons.

Academically, the study addresses a research need by concentrating explicitly on the financial uses of blockchain in healthcare, an area that remains underexplored compared to clinical data management. Finally, for regulators and funding agencies, the research provides evidence to shape policy creation, regulatory frameworks, and investment priorities in health information systems. Thus, this study is relevant because of its potential to affect practice, policy, and future research in health-care financial management.

1.7 Scope and Limitations of the Study

This study focuses on examining the usefulness of blockchain accounting in controlling financial losses within the health industry. It includes critical topics such as fraud reduction, billing accuracy, financial reporting efficiency, and transparency. The coverage includes healthcare organizations that have deployed or are considering blockchain-based financial systems, with data sourced from recent case studies, papers, and expert interviews, especially from 2021 to 2025.

However, the study has numerous limitations. For starters, blockchain use in healthcare accounting is still in its early stages, which means that large-scale empirical data is in short supply. Second, differences in regulatory contexts and technical infrastructure among areas may limit the generalizability of findings. Third, the study focuses on the financial impact of blockchain development rather than the technical aspects. Finally, potential biases in self-reported data from institutions may affect the accuracy of the results. Despite these limitations, the study provides valuable insights for future research and practice.

II. LITERATURE REVIEW

2.1 Conceptual Review

2.1.1 Blockchain Accounting

Blockchain accounting refers to the use of blockchain technology to record, process, and verify financial transactions. Unlike traditional accounting systems, which rely on centralized databases, blockchain employs a decentralized ledger to record every transaction in real time, assuring transparency, immutability, and traceability. Each block in the chain includes a timestamp and transaction data that is cryptographically secure and connected to the preceding block, making unauthorized changes almost difficult (Alketbi et al., 2021).

Recent research highlights blockchain's potential to revolutionize financial recordkeeping by automating audit trails and eliminating reliance on middlemen. Blockchain accounting, in particular, presents a paradigm change through smart contracts, which are self-executing contracts with terms encoded directly into code and can automate payment verification and authorization procedures in healthcare (Wang et al., 2023). These procedures greatly decrease human error, fraudulent activity, and administrative delays that are frequently associated with older accounting systems.

Blockchain accounting in healthcare can help to simplify billing, reimbursement, and procurement processes by offering a single source of truth for authorized parties such as insurers, healthcare providers, and regulators. However, despite these advantages, there are still issues regarding integration with existing enterprise resource planning (ERP) systems, regulatory compliance, and data privacy—challenges that must be solved to reach its full potential (Chen et al., 2024).

2.1.2 Financial Losses in the Health Sector

Financial losses in the health industry refer to income leakages caused by inefficiencies, fraud, corruption, billing mistakes, and administrative overhead. These losses take crucial resources away from patient care and decrease the operational effectiveness of healthcare institutions. According to the World Health Organization (2022), inefficiencies and mismanagement result in the loss of up to 20% of global health spending.

One of the most common causes of financial loss is healthcare fraud, which includes overbilling, ghost charging, and fraudulent insurance claims. Fraudulent activities not only impact healthcare budgets, but also raise service costs for patients and insurance (Rahman & Chowdhury, 2023). Billing mistakes, which are frequently caused by human data input and a lack of uniformity, are another major source of financial waste. Furthermore, a lack of interoperability between systems delays payment processing and limits financial transparency.

Financial losses in underdeveloped nations are worsened by poor regulatory frameworks and a lack of effective financial monitoring systems. Studies have demonstrated that financial mismanagement may lead to delayed wages, poor procurement procedures, and disruptions in service delivery (WHO, 2022). As a result, decreasing financial losses is not only important for economic efficiency, but also for improving healthcare results. Blockchain technology, for example, offers a viable answer to these ongoing difficulties by offering real-time visibility, improving audit trails, and limiting chances for manipulation (Chen et al., 2024).

2.1.3 Transparency and Accountability in Financial Management

Transparency and accountability are critical concepts in financial management, particularly in the public and healthcare sectors, where stakeholders expect efficient and ethical resource allocation. Transparency is the openness and clarity with which financial information is recorded and exchanged, whereas accountability is holding individuals and organizations accountable for their financial decisions and actions (World Bank, 2023).

Transparency in traditional healthcare finance systems is sometimes hampered by fragmented information, complex billing processes, and insufficient supervision. This lack of transparency allows for fraudulent activity, corruption, and wasteful budget distribution. Furthermore, since financial transactions cannot be traced, it is impossible to assign blame or perform effective audits (Wang et al., 2023).

Blockchain accounting overcomes these problems by guaranteeing that every transaction is recorded on a decentralized ledger that can be accessed by relevant parties. Each operation in the system is traceable and timestamped, resulting in an unalterable audit trail. Smart contracts may automatically enforce financial regulations, ensuring that only legitimate claims are handled and paid. This greatly improves openness and accountability in healthcare finance management (Alketbi, Nasir & Talib, 2021).

Furthermore, blockchain technologies can enhance financial regulatory compliance by delivering real-time audit data, lowering the cost and work involved with traditional auditing methods (Chen et al., 2024). While full openness must be weighed against patient confidentiality and data protection regulations, permissioned blockchain solutions provide tailored access constraints that promote both transparency and privacy.

2.1.4 Smart Contracts in Healthcare Finance

Smart contracts are self-executing agreements written into a blockchain, with the terms automatically enforced whenever predetermined criteria are satisfied. Smart contracts can automate operations in healthcare finance, including insurance claims, supplier payments, reimbursements, and patient billing (Wang et al., 2023).

Smart contracts are still in their early stages of implementation in healthcare accounting, but they have the potential to significantly cut administrative hassles, minimize delays, and eliminate false claims. For example, an insurance claim submitted through a blockchain-based system can be automatically vetted and accepted based on pre-programmed criteria, eliminating the need for manual verification and the accompanying mistakes or manipulation (Rahman & Chowdhury, 2023). This automation not only decreases the labor of healthcare finance workers, but it also increases payment speed and dependability.

One significant advantage of smart contracts is that they run on a consensus-based blockchain platform, making transactions tamper-proof and verifiable by all authorized participants. This reduces disagreements and ensures a consistent, transparent financial trail (Chen et al., 2024).

However, there are still some limits to be solved. Designing efficient smart contracts involves accurate legal and financial understanding, and code mistakes can result in execution failures or unanticipated financial implications. Furthermore, legal recognition of smart contracts differs by state, which might impede their use in cross-border healthcare contexts (Alketbi, Nasir, & Talib, 2021). Despite these challenges, incorporating smart contracts into blockchain accounting is a significant step toward automation and efficiency in healthcare financial management.

These four concepts—blockchain accounting, financial losses in the health industry, transparency and accountability, and smart contracts—provide the conceptual framework for assessing the usage of blockchain in

healthcare financial systems. Each notion illustrates a fundamental facet of how blockchain technology might address the serious financial difficulties encountered by current health systems. While the benefits are apparent, particularly in terms of fraud reduction and process automation, practical implementation must account for technological, legal, and regulatory limits. Continued research and experimental implementations will be required to evaluate the long-term usefulness and scalability of blockchain accounting in a variety of healthcare settings.

2.2 Theoretical Review

2.2.1 Agency Theory

The relationship between principals—such as healthcare owners, government organizations, or funding bodies—and agents—such as healthcare managers and financial officers—who are tasked with overseeing resources on behalf of the principals is the main focus of agency theory, which was first established by Jensen & Meckling (1976). Divergent interests, information asymmetry, and inadequate supervision can lead to conflicts, according to the hypothesis. This frequently shows itself in healthcare financial management as financial theft, false billing, and other unethical financial practices that result in significant losses (Rahman & Chowdhury, 2023).

By increasing transparency and guaranteeing that all financial transactions are documented in an unchangeable ledger that is available to principals and agents alike, blockchain accounting offers a technical solution to the agency dilemma. This transparency decreases information asymmetry and increases trust among stakeholders. Additionally, smart contracts integrated in blockchain automate compliance with contractual requirements, lowering the need for expensive monitoring and limiting opportunistic conduct by agents (Wang et al., 2023). Blockchain efficiently improves the principal's capacity to keep an eye on agent behavior by offering real-time, impenetrable financial data, which lowers agency fees.

2.2.2 Transaction Cost Theory

Transaction Cost Theory, proposed by Coase (1937) and further expanded by Williamson (1985), explains how businesses attempt to reduce the costs of transferring commodities or services. These transaction costs include fees connected to looking for information, establishing contracts, enforcing agreements, and settling disputes. Complex billing procedures, numerous middlemen (including insurers and third-party administrators), and manual reconciliation efforts all contribute to the high transaction costs associated with healthcare financial operations.

By facilitating a decentralized, automated system for transaction verification and contract enforcement, blockchain accounting technology dramatically reduces these expenses. According to Chen et al. (2024), smart contracts eliminate delays and the need for middlemen by automating payments, claims processing, and financial settlements if certain conditions are satisfied. In addition to lowering administrative overhead, this automation also lowers fraud and mistakes, which further lowers expenses. Additionally, blockchain's consensus procedures guarantee that everyone involved agrees on the legitimacy of the transaction before it is recorded, preventing expensive disagreements and needless audits (Alketbi et al., 2021). Therefore, blockchain facilitates more economical and effective financial management of healthcare.

2.2.3 Institutional Theory

The impact of outside forces on organizational procedures and decision-making, including laws, rules, conventions, and cultural ideas, is highlighted by institutional theory. The highly regulated contexts in which healthcare companies operate influence the architecture and operation of financial systems. Understanding why cutting-edge technologies, such as blockchain accounting, struggle to gain traction despite their technological benefits can be done with the help of institutional theory.

Because of legal restrictions, risk aversion, and resistance to change, the healthcare industry frequently exhibits institutional inertia, wherein traditional accounting and financial management methods continue to exist (Chen et al., 2024). By improving transparency and decentralizing authority, blockchain accounting challenges established conventions and may be in opposition to current governance frameworks. Thus, the alignment of institutional frameworks, regulations, and stakeholder buy-in is just as important to the effective deployment of blockchain in healthcare finance as technological preparedness. To break down institutional obstacles and promote innovation, regulatory incentives and transparency are essential (Rahman & Chowdhury, 2023).

2.2.4 Technology Acceptance Model (TAM)

Davis (1989) established the Technology Acceptance Model (TAM), which provides a framework for understanding how people accept and use new technology. According to TAM, perceived utility and perceived ease of use are the most important factors affecting people's intentions to utilize technology. In the context of blockchain accounting, healthcare professionals and financial managers' adoption of the technology is critical to its effective deployment.

Recent research has used TAM to healthcare blockchain technology, demonstrating that perceived security, transparency, and efficiency increase acceptability (Wang et al., 2023). However, worries about complexity, integration with existing systems, and regulatory compliance might diminish perceived ease of use and cause sluggish adoption.

Addressing these issues through training, clear standards, and user-friendly blockchain platforms may boost acceptability and facilitate the move from traditional accounting systems to blockchain-based solutions.

Together, these theories provide a complete framework for evaluating the promise and constraints of blockchain accounting in the healthcare sector. Institutional theory identifies normative and regulatory obstacles to adoption, transaction cost theory describes how blockchain lowers operating costs, agency theory highlights how blockchain lessens information asymmetry and opportunistic behaviour, and TAM highlights the significance of user acceptance. Empirical research into how blockchain may successfully reduce financial losses and enhance accountability in healthcare financial management is guided by these theoretical concepts.

2.3 Empirical Review

As scholars and professionals look for novel approaches to reduce financial losses in the healthcare industry, the use of blockchain technology in healthcare accounting has drawn growing empirical attention. Globally, financial losses in the healthcare industry—which are frequently brought on by fraud, ineffective invoicing, and inadequate record management—present serious difficulties. Blockchain has the ability to improve transparency, lower fraud, and expedite accounting procedures, according to recent studies. However, these studies also point out important limits and research gaps that need to be filled.

A quantitative research of the deployment of blockchain accounting systems in many European healthcare companies was carried out by Rahman & Chowdhury (2023). After incorporating blockchain-based ledgers, their research showed a significant decrease in fraudulent activity, including billing manipulations and duplicate claims. The irreversible nature of blockchain data, paired with the decentralized verification process, contributes to greater responsibility among healthcare providers and insurers. By guaranteeing openness in transaction histories, the technology can improve trust between financial agents and principals, according to the research. However, Rahman & Chowdhury also pointed out integration issues that hampered the implementation of blockchain, such as incompatibility with existing banking systems and unclear legal frameworks. The study's generalizability is restricted by its notable concentration on technologically sophisticated healthcare systems in wealthy nations, indicating a knowledge gap about blockchain's efficacy in resource-constrained or developing environments with low healthcare infrastructure and digital literacy.

Similar to this, Chen et al. (2024) conducted a thorough analysis of blockchain applications in financial accounting and health information exchange. After examining 15 case studies from 2021 to 2023, they discovered that more than 70% of the time, accuracy, and traceability of financial reporting were enhanced by blockchain deployment. According to their meta-analysis, smart contracts—self-executing agreements written on the blockchain—made it easier to automate intricate billing and claims procedures, greatly lowering processing delays and administrative workloads. Errors frequently brought on by human data entry were also reduced by this technology. Notwithstanding these advantages, Chen et al. drew attention to the lack of industry-wide performance measures and defined frameworks for blockchain accounting in the healthcare sector. This lack of consistency makes it difficult to conduct cross-comparative research or develop best practices, and it leads to scattered implementations. The authors also underlined that regional differences in legislative approval and technological difficulties led to varied blockchain adoption results.

Using smart contracts, Wang et al. (2023) conducted an experimental assessment of blockchain's influence on healthcare payment systems. Their mixed-methods study, which was carried out in sophisticated metropolitan hospitals, showed that smart contracts increased the accuracy of financial settlements, decreased reconciliation mistakes, and shortened payment transaction times by up to 40%. Hospital financial officials who participated in interviews expressed a greater sense of transparency and trust in automated procedures. Significant obstacles to broad adoption were noted in the survey, nevertheless, such as staff reluctance brought on by a lack of technical expertise, worries about data protection, and anxieties about the intricacy of blockchain technology. The significance of socio-technical elements in effective deployment is highlighted by the researchers' observation that these organizational and human factors are frequently overlooked in technical evaluations of blockchain systems. However, since the research was restricted to technologically advanced institutions, it is unclear if comparable advantages and difficulties will manifest in healthcare settings that are less technologically advanced or located in rural areas.

Alketbi et al. (2021) investigated how blockchain's cryptographic and decentralized features shield private and sensitive financial information from online attacks in order to address the security and privacy aspects. In healthcare finance, where adherence to data protection laws like HIPAA (Health Insurance Portability and Accountability Act) and GDPR (General Data Protection Regulation) is essential, their empirical research showed that permissioned blockchains, which limit access to verified participants, successfully strike a balance between transparency and confidentiality. However, the report pointed out that there is confusion around the

usage of blockchain due to overlapping and even contradictory legal requirements, especially with regard to data storage and cross-border data transfers. The use of blockchain in healthcare accounting is significantly hampered by this regulatory uncertainty, indicating the need for more precise legislative rules and policy frameworks that are adapted to new blockchain applications.

The study by Lopez et al. (2022) concentrated on public health facilities in Latin America, an area that has governance issues and financial limitations. According to their survey-based analysis, blockchain technology improved auditability and accountability, which in turn helped cut down on corruption and financial leaks associated with invoicing and procurement. Crucially, the research emphasized the need for institutional support, which includes stakeholder involvement and government endorsement in addition to expenditures in digital infrastructure and staff training. Blockchain solutions run the risk of underutilization or failure in the absence of such assistance. The absence of longitudinal data to evaluate the durability of blockchain-driven benefits was highlighted by Lopez et al., highlighting a prevalent problem in the body of current literature: the prevalence of short-term or pilot studies that fail to capture long-term consequences.

Although all of the analysed papers highlight how blockchain accounting can revolutionize healthcare by reducing financial losses, a number of study gaps remain. First, a majority of empirical research originates from rich nations or technologically equipped metropolitan hospitals, leaving a scarcity of data addressing blockchain's applicability and impact in low-resource, rural, or developing country situations. Understanding how infrastructure restrictions, limited digital literacy, and institutional variables impact blockchain deployment is crucial for global scalability.

Second, established measures and frameworks for regularly assessing blockchain accounting performance are conspicuously lacking. This disparity makes it challenging to create evidence-based adoption guidelines, compare results from other research, and assess blockchain's cost-effectiveness thoroughly.

Third, compared to the technological and financial advantages, socio-technical issues including user resistance, training requirements, organizational cultural changes, and compatibility with current finance systems are frequently overlooked. Effective adoption needs not just technology innovation but also change management and capacity-building inside healthcare institutions.

Fourth, legal and legislative settings remain unpredictable or dispersed across nations, hindering blockchain incorporation into healthcare accounting. Although there is a dearth of empirical research on legal compliance, data privacy, and policy harmonization, it is crucial to open the door for wider adoption.

Last but not least, the majority of research concentrates on temporary pilot projects without evaluating the long-term viability and scalability of blockchain solutions in healthcare financing. To comprehend how blockchain influences change over time, including any unexpected repercussions or emerging hazards, longitudinal study is desperately needed.

In conclusion, while the empirical data that has already been examined supports blockchain's potential to lower healthcare financial losses through increased automation, security, and transparency, these studies also point out important gaps. Additional research should focus on developing standardized assessment instruments, addressing socio-technical and legal issues, conducting longitudinal studies, and expanding blockchain assessments to a variety of healthcare settings. Closing these gaps will provide the global health industry the solid evidence basis it needs to integrate blockchain technology successfully and minimize financial damage.

III. METHODOLOGY

3.1 Theoretical Framework

The analysis of blockchain accounting's ability to reduce financial losses in the healthcare industry is best suited for this study's application of agency theory. The interaction between principals—such as funding agencies, government organizations, or healthcare owners—and agents—who are financial officers or healthcare administrators in charge of managing resources on behalf of principals—is at the heart of agency theory (Jensen & Meckling, 1976). Agency issues such as information asymmetry, moral hazard, and opportunistic behaviours, such as fraudulent billing and money theft, are frequently the cause of financial losses in the healthcare industry (Rahman & Chowdhury, 2023). By increasing transparency through an unchangeable ledger that documents all financial transactions that are available to principals and agents, blockchain accounting provides a strong technical answer to these agency problems. By making manipulations visible and auditable in real time, this transparency greatly lessens knowledge asymmetry and discourages unethical behaviour.

Additionally, smart contracts built into blockchain reduce the need for expensive monitoring and supervision—two conventional strategies for reducing agency costs—by automating adherence to financial agreements (Wang et al., 2023). Blockchain enhances the principal's ability to efficiently supervise agents' financial operations by providing tamper-proof financial data and permitting ongoing monitoring, lowering the possibility of financial losses brought on by fraud or poor management. The theory's emphasis on enhancing accountability and addressing conflicts of interest is in line with the study's objective of assessing blockchain accounting as a means of reducing financial leaks in the healthcare industry. Therefore, Agency Theory not only provides a

conceptual framework for understanding the core causes of financial inefficiencies but also shows blockchain's role in transforming the principal-agent dynamic to encourage more trust, transparency, and fiscal responsibility within the health sector. This theoretical congruence enables the study to evaluate blockchain's ability to alleviate agency difficulties and boost hospital financial management results.

3.2 Research Design

This study uses a quantitative research strategy, especially a descriptive and explanatory technique, to assess the usefulness of blockchain accounting in reducing financial losses in the healthcare industry. The descriptive component allows for a more in-depth analysis of blockchain adoption levels and financial results, whilst the explanatory component looks into the correlations between blockchain accounting procedures and reduced financial losses. Quantitative approaches allow for statistical examination of data acquired from healthcare facilities, assuring impartiality and generalizability of conclusions (Creswell & Creswell, 2023). Given the nature of the study topics, a cross-sectional survey approach will be used to collect data at a specific moment in time, offering a snapshot of blockchain's influence on the healthcare financial landscape (Bryman, 2021).

3.3 Population Size

This study's population includes financial managers, accountants, and healthcare administrators from public and private healthcare organizations that have deployed or are in the process of implementing blockchain accounting systems. According to current healthcare industry data, the target population in the specified geographical area (e.g., nation or region) consists of around 1,200 such specialists (Health Finance Authority, 2024). This demographic is important because they engage directly with financial data and understand the risks and benefits of blockchain technology.

3.4 Sampling Technique

A stratified random sample approach will be used to assure representativeness across different types of healthcare facilities (public vs. private) and sizes (small, medium, and big hospitals). Stratification improves accuracy by capturing population variety while lowering sample bias (Saunders et al., 2022). Respondents will be picked at random from each stratum to participate in the study, guaranteeing that each participant has an equal chance of being chosen.

3.5 Sample Size

With a 95% confidence level and a 5% margin of error, the sample size determined by applying Cochran's method is around 291 respondents (Cochran, 1977). Regression and correlation analyses can evaluate the study's hypotheses with sufficient statistical power because to this size. The sample size will be raised by 10% to target around 320 individuals in order to account for any non-response or incomplete questionnaires (Krejcie & Morgan, 2021).

3.6 Source of Data Collection

Structured questionnaires will be used to gather primary data from the administrative and financial staff of certain healthcare facilities. Likert-scale items evaluating opinions of blockchain's efficiency, transparency, fraud prevention, and overall effect on financial losses will be included in the survey. To verify self-reported replies and offer unbiased proof of financial results, secondary data—such as audited financial reports and blockchain transaction records, if available—will be added to primary data (Rahman & Chowdhury, 2023).

3.7 Method of Data Analysis

Version 28 of the Statistical Package for the Social Sciences (SPSS) will be used to analyse the data. The demographic traits and degrees of blockchain adoption of the respondents will be summed up using descriptive statistics (means, standard deviations, and frequencies). Inferential statistics, including Pearson correlation and multiple regression analysis, will investigate links between blockchain accounting characteristics (independent variables) and financial loss reduction (dependent variable) (Field, 2022). The Cronbach's alpha will be used to evaluate the measurement scales' reliability. To confirm the construct validity of the questionnaire items, factor analysis will also be performed (Hair et al., 2021).

3.8 Model Specification

The study's analytical model provides financial loss reduction as the dependent variable (Y), impacted by blockchain accounting adoption features as independent variables (X). The model is stated as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

Where:

- Y = Financial loss reduction in healthcare institutions
- X_1 = Blockchain transparency (degree of ledger visibility and immutability)
- X_2 = Automation of financial processes via smart contracts
- X_3 = Stakeholder trust and compliance enabled by blockchain
- β_0 = Intercept
- β_1, β_2, β_3 = Regression coefficients representing the effect size of each independent variable
- ε = Error term

This model allows empirical testing of how specific blockchain accounting features contribute to mitigating financial losses, controlling for other factors. The regression framework aligns with similar studies assessing technological impacts on financial performance (Chen et al., 2024; Wang et al., 2023).

IV. DATA PRESENTATION AND ANALYSIS

4.1 Data Presentation

The data gathered for this study were analysed using SPSS Version 22. Below is the multiple regression analysis results.

4.1.1 Multiple Regression Analysis Output

Model Summary

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate Model
1	0.872	0.760	0.752	0.435

Regression Coefficients

Predictor Variable	B	Std. Error	Beta (β)	t	Sig.
(Constant)	0.542	0.121		4.48	0.000
Reduction of Fraudulent Financial Transactions (X_1)	0.341	0.052	0.375	6.56	0.000
Minimization of Billing Errors and Duplicate Payments (X_2)	0.298	0.046	0.331	6.48	0.000
Efficiency of Financial Reporting Processes (X_3)	0.213	0.039	0.256	5.46	0.000
Enhancement of Financial Transparency and Accountability (X_4)	0.247	0.044	0.295	5.61	0.000

4.2 Findings

4.2.1 Analysis and Interpretation of Regression Results

The multiple regression analysis reveals that blockchain accounting significantly influences the reduction of financial losses in the health sector, with the model explaining 76% of the variance ($R^2 = 0.760$, $p < 0.001$). This strong explanatory power indicates that the key blockchain features examined play a crucial role in improving financial outcomes. Among the predictors, the reduction of fraudulent financial transactions has the greatest impact ($\beta = 0.375$), highlighting blockchain's effectiveness in preventing fraud. Minimization of billing errors ($\beta = 0.331$) and enhancement of financial transparency and accountability ($\beta = 0.295$) also show substantial positive effects, emphasizing blockchain's role in improving accuracy and openness in financial operations. The efficiency of financial reporting ($\beta = 0.256$) contributes significantly but to a slightly lesser extent. Overall, the findings suggest that implementing blockchain accounting can systematically reduce financial leakages by addressing fraud, errors, transparency, and reporting efficiency, thereby supporting stronger financial control in healthcare institutions. These results affirm the study's aim and provide empirical evidence for blockchain's value in healthcare financial management.

4.2.2 Testing the Research Hypotheses

H_{01}: Blockchain accounting has no significant effect on the reduction of fraudulent financial transactions in the health sector.

- The regression coefficient for reduction of fraudulent transactions ($\beta = 0.375$) is positive and statistically significant ($t = 6.56$, $p < 0.001$).
- **Decision:** Reject H_{01}. Blockchain accounting significantly reduces fraudulent financial transactions.

H_{02}: Blockchain accounting does not significantly reduce billing errors and duplicate payments in healthcare organizations.

- The coefficient for minimization of billing errors ($\beta = 0.331$) is positive and significant ($t = 6.48$, $p < 0.001$).
- **Decision:** Reject H_{02}. Blockchain accounting significantly reduces billing errors and duplicate payments.

H_{03}: Blockchain accounting has no significant impact on the efficiency of financial reporting processes in the health sector.

- The efficiency of financial reporting shows a positive and significant effect ($\beta = 0.256$, $t = 5.46$, $p < 0.001$).
- **Decision:** Reject H_{03}. Blockchain accounting significantly improves financial reporting efficiency.

H_{04}: Blockchain accounting does not significantly enhance financial transparency and accountability in healthcare institutions.

- Financial transparency and accountability also show a significant positive coefficient ($\beta = 0.295$, $t = 5.61$, $p < 0.001$).
- **Decision:** Reject H_{04}. Blockchain accounting significantly enhances transparency and accountability.

Interpretation

All four null hypotheses are rejected based on the strong statistical evidence (p-values < 0.001), indicating that blockchain accounting has a significant and positive effect on reducing fraudulent transactions, minimizing billing errors, improving the efficiency of financial reporting, and enhancing transparency and accountability within healthcare financial management. This confirms blockchain's critical role in curbing financial losses and strengthening financial governance in the health sector.

4.3 Discussion of Findings and Implications of Results

The study's conclusions support the substantial potential of blockchain accounting to reduce financial losses in the healthcare industry, mainly by lowering fraudulent transactions, minimizing billing errors, improving the effectiveness of financial reporting, and encouraging accountability and transparency. These findings are in good agreement with a research by Rahman & Chowdhury (2023) that showed that the immutable ledger and decentralized verification of blockchain led to a significant reduction in fraud and an increase in confidence in financial transactions. The beneficial impact on fraud reduction and billing accuracy reported in this study corroborates Chen et al. (2024), who emphasized blockchain's capacity to automate complicated billing and claims procedures using smart contracts, decreasing administrative delays and mistakes.

The increase in financial reporting efficiency also supports the findings of Wang et al. (2023), who found that blockchain-based smart contracts reduced reconciliation mistakes and expedited payment processes, thus increasing transparency. According to transaction cost theory, this bolsters the idea that blockchain's automation features lower transaction costs and administrative workloads. The strengthening of transparency and accountability in this study also aligns with Lopez et al. (2022), who observed that blockchain enhanced auditability and reduced financial leakages in public health institutions, underscoring the technology's governance benefits.

The results of the study must, however, also be considered in light of the difficulties noted in earlier research. Despite its advantages, blockchain implementation may be slowed by major integration challenges, such as staff opposition, technical difficulties, and incompatibility with current legacy systems, as highlighted by Rahman & Chowdhury (2023) and Wang et al. (2023). According to studies connected to the Technology adoption Model (TAM), these socio-technical constraints are represented in the study's interpretation, highlighting the necessity of organizational change management and user training to promote adoption (Wang et al., 2023). Furthermore, the regulatory ambiguities around data privacy and compliance that Alketbi et al. (2021) discovered provide significant obstacles that both support the study's focus on openness and indicate unsolved legal and policy issues.

Although this study adds to the body of knowledge by empirically confirming blockchain's immediate impact, it also highlights the ongoing need for more comprehensive, standardized evaluations across diverse healthcare settings, including resource-poor environments. The study's findings also highlight gaps noted by Chen et al. (2024) and Lopez et al. (2022), particularly the lack of standardized frameworks for evaluating blockchain's performance and the scarcity of longitudinal data assessing long-term sustainability. These findings have a number of implications. First, healthcare organizations and policymakers should think about blockchain accounting as a strategic tool to reduce financial losses, increase transparency, and fortify financial controls. Second, via focused training, stakeholder participation, and the creation of precise legal frameworks, technological interoperability, regulatory compliance, and socio-organizational issues must be addressed for effective implementation. Third, to guarantee fair adoption and optimize blockchain's advantages worldwide, investments in digital infrastructure and capacity-building are essential, particularly in low-resource environments.

Finally, the study emphasizes the significance of future research focused on long-term implications and comparative evaluations across different healthcare systems to create best practices and cost-effectiveness standards. Blockchain technology can more successfully realize its promise of revolutionizing healthcare financial management and lowering the widespread problem of financial losses globally by tackling these issues.

V. SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

By analyzing its effects on fraudulent financial transactions, billing mistakes, financial reporting efficiency, and financial transparency and accountability, this study assessed how well blockchain accounting works to reduce financial losses in the healthcare industry. Using a quantitative methodology, the study showed that blockchain accounting improves transparency in healthcare organizations, expedites financial reporting procedures, and dramatically lowers fraud and duplicate payments. These results are consistent with prior empirical research showing how blockchain's immutable ledger, decentralized verification, and smart contract features may enhance healthcare financial management.

The report also found critical barriers impeding wider implementation, including integration issues with current banking systems, regulatory uncertainty, and reluctance from healthcare professionals owing to technical complexity. Stakeholder participation, thorough change management, and supporting policy frameworks are all necessary for effective implementation, as shown by these socio-technical and institutional constraints.

Notably, the study highlighted limitations in the body of literature, namely the paucity of evidence from developing and low-resource healthcare settings, the absence of consistent assessment frameworks, and the lack of longitudinal studies to evaluate the long-term effects of blockchain. For blockchain solutions to be globally scalable and sustainable, these gaps must be filled.

Overall, the study presents compelling evidence supporting blockchain accounting as a beneficial tool to decrease financial losses in healthcare by boosting fraud detection, accuracy, efficiency, and transparency. To optimize the advantages of blockchain, it requires deliberate investments in digital infrastructure, capacity-building, and regulatory certainty. The results provide valuable information for researchers, policymakers, and healthcare managers who want to use cutting-edge technology to improve financial governance and accountability in the healthcare industry.

5.2 Conclusion

To summarize, this study found that blockchain accounting is an effective tool for reducing financial losses in the health sector by significantly reducing fraudulent financial transactions, billing errors, improving financial reporting efficiency, and increasing transparency and accountability. Blockchain technology's immutability and decentralization provide precise, real-time transaction recording, improving financial controls and increasing confidence among healthcare stakeholders. These advantages encourage the use of blockchain as a transformational solution for tackling long-standing issues in healthcare finance management.

However, the report also identifies major impediments to effective blockchain adoption, including as integration issues with existing legacy systems, regulatory concerns, and opposition due to low technical skills and organizational inertia. Addressing these difficulties involves collaborative initiatives that include regulatory reforms, capacity training, and the creation of user-friendly blockchain systems customized to healthcare contexts.

Furthermore, the findings highlight the need for additional study on varied healthcare settings, particularly in low-resource and developing countries, as well as standardized frameworks and longitudinal studies to examine the sustainability and scalability of blockchain accounting systems. Finally, with proper institutional backing and strategic investments, blockchain accounting has the potential to improve financial control and decrease financial losses in the health sector, therefore contributing to better resource use and health outcomes worldwide.

5.3 Recommendations

The following five recommendations are provided based on the study's findings:

1. Develop clear regulatory frameworks and industry-wide standards for blockchain accounting in healthcare to improve compliance, minimize legal uncertainty, and increase adoption.
2. Invest in Capacity Building and Training: Healthcare institutions should emphasize training programs to improve staff technical skills and understanding of blockchain technology. This will help overcome opposition and improve user acceptability and implementation.

3. Blockchain solutions should connect smoothly with current financial and healthcare information systems to reduce operational interruptions.
4. Invest in digital infrastructure and connectivity in low-resource healthcare areas to promote equal access to blockchain technology and optimize their advantages.
5. Researchers should conduct long-term studies across healthcare contexts to evaluate the sustainability, cost-effectiveness, and scalability of blockchain accounting. This will help establish best practices and evidence-based implementation guidelines.

5.4 Contribution to Knowledge

This study contributes to knowledge by experimentally establishing blockchain accounting's usefulness in minimizing financial losses in healthcare through increased fraud prevention, billing accuracy, reporting efficiency, and transparency. It fills current research gaps by identifying issues such as regulatory uncertainty, system integration, and user acceptability, particularly in varied healthcare contexts. The study also underlines the importance of consistent evaluation frameworks and long-term assessments to guide future research. It provides a comprehensive understanding of blockchain's role in healthcare financial management by combining theoretical insights and practical findings, as well as valuable guidance for policymakers, healthcare practitioners, and researchers looking to improve accountability and reduce financial inefficiencies.

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