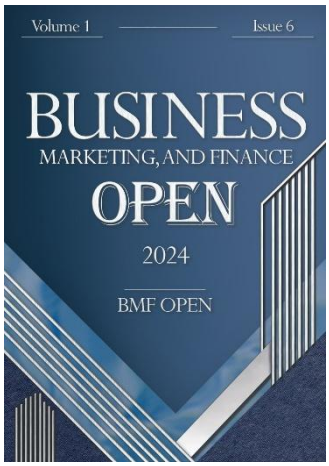
The Role of Blockchain Technology in Strengthening Innovative Accounting Practices: A Multidimensional Data-Driven Approach



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Abstract: This study adopts a multidimensional approach grounded in grounded theory to examine the transformative role of blockchain technology in enhancing innovative accounting practices. The primary objective of the research is to analyze how blockchain influences the enhancement of financial transparency, the improvement of data accuracy, the support of intelligent auditing, and the strengthening of innovative competencies among accountants and financial managers. Using a qualitative methodology based on grounded theory principles, data were collected through semi-structured interviews with experts and analyzed across three stages of open, axial, and selective coding. This process resulted in the development of a conceptual model derived from real-world experiences. The findings indicate that blockchain technology has the potential to transform traditional accounting systems by enabling real-time transparency, reducing errors and financial fraud, and improving the quality of decision-making. Technological proficiency and professional creativity emerge as key factors in the successful implementation of this technology. Nevertheless, challenges such as infrastructural weaknesses, legal ambiguities, and cultural resistance continue to pose significant barriers. This study emphasizes that realizing the full potential of blockchain in accounting requires the formulation of targeted strategies, organizational readiness, and investment in the development of digital skills. The proposed conceptual model serves as a practical roadmap for policymakers, educational institutions, and financial organizations seeking to effectively leverage this emerging technology.

Keywords: Blockchain, Innovative Accounting, Grounded Theory, Financial Transparency, Technological Competence, Intelligent Auditing

1. Introduction

Blockchain technology has rapidly evolved from a niche technological innovation underpinning cryptocurrencies into a foundational digital infrastructure with far-reaching implications for organizational governance, financial reporting, and accounting practices. In recent years, scholars and practitioners have increasingly recognized blockchain as a disruptive force capable of redefining the logic of recording, verifying, and

reporting economic transactions, particularly in environments characterized by information asymmetry, low trust, and complex interorganizational relationships [1, 2]. Within the field of accounting, blockchain is no longer viewed merely as a technical tool but rather as a socio-technical system that reshapes professional roles, institutional arrangements, and decision-making processes [3, 4].

Traditional accounting systems are largely centralized, reliant on sequential verification mechanisms, and vulnerable to manipulation, delay, and human error. These limitations have become increasingly salient in the context of digital transformation, where real-time data, transparency, and auditability are critical organizational requirements [5, 6]. Blockchain's core characteristics—immutability, decentralization, cryptographic security, and distributed consensus—directly challenge the assumptions underpinning double-entry bookkeeping and centralized control structures [1, 7]. As a result, blockchain has been described as a catalyst for a paradigmatic shift toward continuous accounting, real-time assurance, and automated compliance mechanisms [4, 8].

A growing body of international literature documents the transformative potential of blockchain across financial accounting, management accounting, and auditing. Systematic reviews highlight its capacity to enhance transparency, reduce reconciliation costs, improve data integrity, and enable smart contracts that automate accounting controls [2, 6]. Empirical and conceptual studies further suggest that blockchain adoption can significantly alter cost management systems, budgeting processes, performance measurement, and internal control architectures in management accounting [9, 10]. From an auditing perspective, blockchain-based ledgers promise near-real-time verification, continuous auditing, and a reconfiguration of assurance services toward higher-value analytical and judgment-based activities [11, 12].

Despite these technological promises, blockchain adoption in accounting remains uneven and highly contingent on contextual, organizational, and human factors. Prior research consistently emphasizes that technological capability alone is insufficient to guarantee successful implementation [3, 13]. Instead, adoption outcomes are shaped by organizational culture, managerial commitment, regulatory clarity, professional skills, and users' cognitive readiness for change [14, 15]. Studies focusing on accountants' behavioral responses further demonstrate that technostress, perceived complexity, and uncertainty about professional roles can inhibit acceptance of blockchain-based systems [13, 15].

In developing and emerging economies, these challenges are often magnified by institutional constraints, regulatory gaps, and limited digital infrastructure. Research conducted in the Iranian context indicates that while awareness of blockchain's potential is growing, its integration into accounting and auditing practices faces structural barriers related to legal ambiguity, conservative regulatory approaches, and insufficient alignment between technological innovation and professional education [11, 16]. Similar findings are reported in sector-specific studies, where blockchain's operational benefits are offset by governance complexities and coordination challenges among stakeholders [17, 18].

Another critical dimension highlighted in recent scholarship is the evolving skill set required of accountants in blockchain-enabled environments. Emerging technologies are redefining accountants' roles from routine record-keepers to analytical, advisory, and strategic partners within organizations [8, 13]. Blockchain literacy, data analytics competence, understanding of cryptographic principles, and the ability to interact with artificial intelligence-driven systems are increasingly viewed as core professional capabilities [19, 20]. However, empirical evidence suggests that professional training systems and organizational learning structures have not yet fully adapted to these new competency requirements [21, 22].

From a theoretical standpoint, existing studies on blockchain in accounting have predominantly relied on technology acceptance models, institutional theory, or innovation diffusion frameworks to explain adoption intentions and outcomes [7, 14]. While these approaches offer valuable insights, they often fail to capture the complex, process-oriented interactions among technological, organizational, managerial, and human factors that shape innovation in real organizational settings [4, 6]. Consequently, several scholars have called for qualitative, data-driven approaches that can uncover context-specific mechanisms and generate grounded conceptual models of blockchain-enabled accounting transformation [6, 23].

Grounded theory, as a systematic qualitative methodology, is particularly well suited to addressing this gap. By emphasizing theory development rooted in empirical data rather than a priori assumptions, grounded theory enables researchers to explore emerging phenomena such as blockchain adoption in accounting within their social, organizational, and institutional contexts [23]. Recent accounting studies employing qualitative approaches have demonstrated the value of capturing practitioners' lived experiences, interpretive frameworks, and adaptive strategies in response to technological disruption [3, 13]. However, comprehensive grounded models that integrate innovation skills development, organizational readiness, governance structures, and technological infrastructure in blockchain-based accounting remain scarce, particularly in non-Western contexts [16, 20].

Moreover, much of the extant literature treats blockchain adoption as an isolated technological decision rather than as an ongoing, multidimensional transformation process. This perspective overlooks the dynamic interplay between causal conditions such as technological infrastructure, contextual conditions such as organizational culture, intervening factors such as human resources and security, strategic responses such as leadership and innovation management, and the resulting organizational outcomes [9, 10]. Addressing this analytical fragmentation requires an integrative framework capable of linking these dimensions into a coherent explanatory model grounded in empirical evidence.

In light of these theoretical and practical gaps, there is a pressing need for research that systematically examines how blockchain technology influences innovative accounting practices through a multidimensional, data-driven lens, particularly within the institutional and professional context of Iran's capital market. Companies listed on the Tehran Stock Exchange provide a relevant empirical setting, as they operate under heightened regulatory scrutiny, complex reporting requirements, and increasing pressure to adopt digital solutions for transparency and competitiveness [16, 22]. Understanding how accountants, financial managers, and technology specialists in these organizations interpret, adopt, and operationalize blockchain can yield valuable insights for policymakers, professional bodies, and organizations seeking to navigate digital transformation in accounting [11, 18].

Accordingly, the aim of this study is to develop a grounded, multidimensional conceptual model that explains the impact of blockchain technology on innovative accounting practices and the development of accountants' innovative skills in companies listed on the Tehran Stock Exchange.

2. Methodology

This study was conducted using a qualitative methodology and a grounded theory approach. The rationale for selecting this approach was to achieve an in-depth understanding of the latent dimensions of the phenomenon and to extract underlying conceptual patterns from real and lived data within the social context of the research. Grounded theory, which is rooted in the naturalistic paradigm and social interpretivism, allows the researcher to develop a conceptual model based on empirical data without imposing prior theoretical assumptions (Farasatkhah, 2016).

The research data were collected through semi-structured interviews. The participants consisted of 25 academic experts, financial managers, senior accountants, and blockchain technology specialists working in companies listed on the Tehran Stock Exchange. Participants were selected using purposive sampling based on the criterion of maximum variation. The sampling process continued until theoretical saturation was achieved, resulting in a total of 25 in-depth interviews. To enhance data coherence, interview guide questions were sent electronically to participants prior to the interviews, and all interviews were conducted with participants' consent, audio-recorded, and subsequently transcribed verbatim.

Data analysis was carried out using the systematic approach proposed by Strauss and Corbin (1998) and involved three stages: open coding, axial coding, and selective coding. During open coding, the data were broken down into discrete conceptual units and initial concepts were identified. In the axial coding stage, similar concepts were categorized into subcategories and main categories, and the relationships among them were analyzed. In the selective coding stage, a core category was identified, and other categories were organized around it, ultimately leading to the development of the study's conceptual model. All collected data were managed and analyzed using MAXQDA software to ensure consistency and accuracy in the coding process.

To enhance the credibility and trustworthiness of the study, member checking and data triangulation techniques were employed. In member checking, the analytical findings were shared with participants to verify the validity of the results. In triangulation, data were collected from individuals with diverse professional backgrounds to ensure the inclusion of multiple perspectives in the analysis. Furthermore, all stages of data collection and analysis were documented transparently and systematically to allow for auditability and re-evaluation.

The adoption of the grounded theory approach in this study facilitated the development of an indigenous and context-specific conceptual model grounded in the real experiences of participants. This model explains the dimensions, factors, strategies, and consequences associated with the application of blockchain technology and the development of innovative skills among accountants and financial managers. The model can serve as a foundation for digital transformation policymaking in financial accounting in Iran.

The final conceptual model of the study integrates contextual conditions, intervening conditions, and operational strategies that lead to individual and organizational outcomes. The analysis of findings aligns with theories such as organizational learning (Argyris & Schön, 1978), technology acceptance (Davis, 1989), and Rogers' innovation diffusion theory (Rogers, 2003). The results indicate that open structures, a learning-oriented culture, transformational leadership, and a strategic perspective toward technology are prerequisites for the institutionalization of innovation. Moreover, by emphasizing the Iranian context, the present study highlights the role of legal gaps, conservative approaches of regulatory bodies, and the lack of supportive policies in slowing down blockchain adoption—factors that are less evident in the international literature. Ultimately, the development of innovative skills requires three fundamental prerequisites: cognitive and cultural readiness for change, adequate technological and knowledge infrastructure, and the presence of supportive policies and regulations. Training alone, in the absence of these conditions, will not lead to the practical realization of innovation.

In this study, the objective is to address the following questions in order to comprehensively examine the impact of blockchain technology on innovative accounting practices using a multidimensional data-driven approach.

1. How can blockchain technology contribute to improving transparency and accuracy in accounting processes?
2. What data security advantages are associated with the use of blockchain in innovative accounting practices?

3. How can multidimensional data be leveraged in blockchain-based accounting models?

3. Findings and Results

The present study was conducted using a qualitative approach and thematic analysis methodology. Given that the primary objective of the research was to identify the factors influencing the development of innovative skills within the context of blockchain technology in companies listed on the Tehran Stock Exchange, the stages of open, axial, and selective coding were rigorously implemented following data collection through semi-structured interviews. The findings derived from data analysis were obtained from 25 in-depth interviews. In the initial stage, raw data underwent open coding, resulting in the identification of more than 150 initial conceptual codes. In the subsequent stage, through aggregation, integration, and categorization, these codes were refined into organizing themes and ultimately consolidated into five core themes. In determining the themes, in addition to systematic data analysis, expert opinions and consultations with the academic supervisor were also taken into account.

Table 1. Demographic Characteristics of Interviewees

No.	Gender	Education / Job Position
1	Female	Financial Manager
2	Male	Senior Auditor and University Faculty Member
3	Female	Audit Manager
4	Male	Financial Analyst
5	Female	Information Technology Manager
6	Male	Financial Projects Manager
7	Female	Financial Analyst
8	Male	Senior Auditor and University Faculty Member
9	Male	Auditor
10	Female	University Faculty Member
11	Male	Financial Expert
12	Male	Financial Manager
13	Male	Financial Analyst
14	Male	Risk Analyst
15	Female	Financial Analyst
16	Female	University Lecturer and Internal Auditor
17	Male	Tax Affairs Expert
18	Female	Senior Accounting Expert and Financial Researcher
19	Male	Investment Consultant
20	Female	Risk and Compliance Manager
21	Male	Budget and Credit Expert
22	Female	Senior Financial Data Analyst
23	Male	Industrial Accounting Manager
24	Female	PhD Researcher in Accounting
25	Male	Chief Financial Officer of a Private Company

According to Table 1, 52% of the interviewees were male and were within the age range of 40–60 years.

The final themes of the study were categorized into ten main dimensions, as presented below.

Table 2. Thematic Coding Structure

Codes	Core Theme
Innovation culture; learning culture; atmosphere of collaboration and trust; encouragement of technological errors; acceptance of errors as part of learning; non-judgmental learning environment; constructive feedback culture; formation of a learning organization; organizational creativity; change in attitudes toward technology; integration of culture and training; creation of an innovation-friendly environment; prevention of creativity	Organizational Culture and Innovation

suppression; trust-building in the face of failure; technological culture-building within the organization; trust in auditing; organizational justice	
Top management support; top management commitment; transformational leadership; technological vision and inspiration; rapid and decisive decision-making; data-driven decision-making; future-oriented managerial perspective; managerial attitudes toward risk and change; perceiving change as threat or opportunity; employee participation in decision-making; listening to team voices; managerial transparency; management openness to innovation; governance accountability; change in managerial mindset; decision-making autonomy; inspiration through managerial competence; facilitation of innovation adoption	Leadership and Management
Decentralized structure; participatory structure; flexible structure; effective supervisory structure; digital transformation committee; blockchain-specific data structure; technology committee; active governance structure; governance and auditing policies; delegation of authority to teams; team-based decision-making; monitoring mechanisms; new reporting processes	Organizational Structure and Policies
Technology development budget; allocation of resources to R&D; communication infrastructure; process analysis teams; precise coordination among network nodes; importance of artificial intelligence and big data; limited effectiveness of blockchain without complementary technologies; need for real-time data processing infrastructure; use of data in decision-making; role of APIs in effective blockchain implementation; importance of intrusion detection systems; need for secure, high-performance servers; application of edge and cloud computing; digital maturity; need for high storage capacity and distributed networks	Technology and Infrastructure
Continuous training; recruitment of specialists; internal training teams; hybrid skill sets for accountants; familiarity with cryptography and distributed ledger technology (DLT); technological training for accountants; accessible training across all organizational levels; development of innovative skills; enhancement of financial skills; analytics-based innovation development; project-based learning; needs-based skill development; comprehensive skill enhancement programs; emphasis on education and research; participatory workshops	Human Resources and Training
Data-driven decision-making; digital data; data orientation in management; use of technological KPIs; financial data analysis on blockchain platforms; analysis of blockchain security challenges; technology risk analysis; assessment of technological risks; analyzability of blockchain data; indicator-based decision-making; need for professional analytical tools	Data Analysis and Decision-Making
Security and regulatory challenges; necessity of cybersecurity implementation; regulatory compliance; need for encryption and access control; blockchain threats in the absence of security preparedness; privacy; immutability of data; data-sharing policies; role of accountants in data governance; adaptive internal controls	Security and Compliance
Absence of clear blockchain regulations; legal gaps in financial data registration; hesitation in blockchain implementation; conflict between blockchain transparency and confidentiality; regulatory lag behind technological advancement; restrictive regulations in Iran; need for new legislation; legal ambiguity regarding the validity of blockchain data; legal risks of blockchain; regulatory avoidance by innovators; need for legal support; absence of a designated supervisory authority for blockchain; legal barriers to innovation	Legal and Regulatory Challenges
Innovation-based performance; employee participation in technology analysis; growth of innovative skills through interaction; increased employee motivation; creative utilization of limited resources; leveraging employee ideas; internal incentive programs; development of blockchain knowledge; implementation of pilot projects; growth of technological skills; establishment of internal innovation centers; innovation embedded in organizational values; strategic prioritization of innovation	Innovation and Organizational Growth
Process automation; reduction of human error; increased accuracy in financial reporting; optimization of resource allocation; operational agility; enhancement of employee productivity through targeted training; innovation in products and services; increased transparency and customer trust; rapid responsiveness	Productivity Enhancement and Competitiveness

Table 3. Basic and Organizing Themes

Code	Basic Theme	Category
Data-driven decision-making; digital data; data-oriented management; use of technological KPIs; analysis of financial data on blockchain platforms; analysis of blockchain security challenges; technology risk analysis; assessment of technological risks; analyzability of blockchain data; indicator-based decision-making; need for professional analytical tools	Data Analysis and Decision-Making	Causal Factors
Technology development budget; allocation of resources to R&D; communication infrastructure; process analysis teams; precise coordination among network nodes; importance of artificial intelligence and big data; limited effectiveness of blockchain without complementary technologies; need for real-time data processing infrastructure; use of data for decision-making; role of APIs in effective blockchain implementation; importance of intrusion detection systems; need for secure, high-performance servers; application of edge and cloud computing; digital maturity; need for high storage capacity and distributed networks	Technology and Infrastructure	Causal Factors
Absence of clear blockchain regulations; legal gaps in financial data registration; hesitation in blockchain implementation; conflict between blockchain transparency and confidentiality; regulatory lag behind technological advancement; restrictive regulations in Iran; need for	Legal and Regulatory Challenges	Causal Factors

enactment of new laws; legal ambiguity regarding the validity of blockchain data; legal risks of blockchain; regulatory avoidance by innovators; need for legal support; absence of a specific supervisory authority for blockchain; legal barriers to innovation		
Decentralized structure; participatory structure; flexible structure; effective supervisory structure; digital transformation committee; blockchain-specific data structure; technology committee; active governance structure; governance structure and auditing policies; delegation of authority to teams; team-based decision-making; monitoring mechanisms; new reporting processes	Organizational Structure and Policies	Contextual Factors
Innovation culture; learning culture; atmosphere of collaboration and trust; encouragement of technological errors; acceptance of errors as part of learning; non-judgmental learning environment; constructive feedback culture; formation of a learning organization; organizational creativity; change in attitudes toward technology; integration of culture and training; creation of an innovation growth environment; prevention of creativity suppression; trust-building in the face of failure; technological culture-building within the organization; trust in auditing; organizational justice	Organizational Culture and Innovation	Contextual Factors
Continuous training; recruitment of specialists; internal training teams; hybrid skill sets of accountants; familiarity with cryptography and distributed ledger technology (DLT); technological training for accountants; comprehensible training for all organizational levels; development of innovative skills; enhancement of financial skills; analytics-based innovation development; project-based learning; needs-based skill development; comprehensive skill enhancement programs; emphasis on education and research; participatory workshops	Human Resources and Training	Intervening Factors
Security and regulatory challenges; necessity of implementing cybersecurity; regulatory compliance; need for encryption and access control; blockchain threats in the absence of security preparedness; privacy; immutability of data; data-sharing policies; role of accountants in data governance; adaptive internal controls	Security and Compliance	Intervening Factors
Top management support; top management commitment; transformational leadership; technological vision and inspiration; rapid and decisive decision-making; data-driven decision-making; future-oriented managerial perspective; managerial attitudes toward risk and change; perceiving change as threat or opportunity; employee participation in decision-making; listening to team voices; managerial transparency; management openness to innovation; governance accountability; change in managerial mindset; decision-making autonomy; inspiration through managerial competence; facilitation of innovation adoption	Leadership and Management	Strategies
Innovation-based performance; employee participation in technology analysis; growth of innovative skills through interaction; increased employee motivation; creative utilization of limited resources; leveraging employee ideas; internal incentive programs; development of blockchain knowledge; implementation of pilot projects; growth of technological skills; establishment of internal innovation centers; innovation embedded in organizational values; strategic prioritization of innovation	Innovation and Organizational Growth	Strategies
Process automation; reduction of human error; increased accuracy in financial reporting; optimization of resource allocation; operational agility; enhancement of employee productivity through targeted training; innovation in products and services; increased transparency and customer trust; rapid responsiveness	Productivity Enhancement and Competitiveness	Outcomes

Table 4. Five Dimensions of Factors Influencing the Development of Accountants' Innovative Skills

Basic Theme	Code
Organizational Dimensions	Providing a foundation for continuous learning, evaluation of innovative performance, and development of emerging technologies
Managerial Dimensions	Technology acceptance and skill enhancement play a central role
Technological Dimensions	Familiarity with blockchain platforms, data analysis capabilities, and users' level of digital maturity
Governance and Institutional Dimensions	Formulation of legal frameworks that support innovation
Innovation Strategies and Outcomes	Enhancement of accountants' professional status, improvement of audit quality, increased transparency, and competitive advantage

To describe the research data, selected descriptive statistics of the study variables are presented below.

Table 4. Descriptive Findings of Research Variable Scores

Research Variables	M (Mean)	Md (Median)	S.D. (Standard Deviation)	Min	Max
Data Analysis and Decision-Making	4.22	4	0.79	2	5
Technology and Infrastructure	4.29	5	0.87	1	5
Legal and Regulatory Challenges	4.24	4	0.92	1	5
Organizational Structure and Policies	3.71	4	0.95	1	5
Organizational Culture and Innovation	3.38	4	1.24	1	5
Human Resources and Training	3.42	4	1.06	1	5
Security and Compliance	3.93	4	1.01	1	5
Leadership and Management	3.88	4	1.08	1	5
Innovation and Organizational Growth	4.16	4	0.71	2	5
Productivity Enhancement and Competitiveness	3.88	4	1.05	1	5

The statistical results indicate that the variables *Technology and Infrastructure*, *Data Analysis and Decision-Making*, and *Innovation and Organizational Growth* obtained the highest mean scores, reflecting their relatively favorable performance. In contrast, *Organizational Culture and Innovation* and *Human Resources and Training* recorded the lowest mean values and therefore require greater managerial and strategic attention. The median of most variables was equal to 4, and the standard deviations ranged from 0.71 to 1.24, indicating a moderate dispersion of responses across certain dimensions.

In inferential statistics, prior to hypothesis testing, it is necessary to examine the type of variables and their distributions. Statistical tests vary depending on whether the variables follow a normal distribution; if the data are not normally distributed, nonparametric tests must be employed. To assess the normality of the data distribution, the Kolmogorov–Smirnov test was applied. The null and alternative hypotheses of the Kolmogorov–Smirnov test are defined as follows.

H_0: The data follow a normal distribution.

H_1: The data do not follow a normal distribution.

The Kolmogorov–Smirnov test was conducted for the research variables, and the results are reported in the table below.

Table 5. Normality Test Results

Variable Dimension	Kolmogorov–Smirnov Statistic	Significance Level
Causal Conditions	1.294	0.070
Contextual Conditions	1.186	0.120
Intervening Conditions	1.205	0.110
Outcomes	1.284	0.074
Strategies	1.335	0.065

As shown in Table 5, the significance levels for all variables are greater than 0.05. Therefore, the Kolmogorov–Smirnov statistics are not significant at the 0.05 error level, and the alternative hypothesis (non-normality of the data) is rejected. Accordingly, the distribution of the variables can be considered normal.

Before testing the hypotheses and the conceptual model, it is essential to assess the validity of the measurement models of the exogenous and endogenous variables. This assessment was conducted using confirmatory factor analysis (CFA). Confirmatory factor analysis is a statistical technique used to evaluate the relationships between latent variables and observed variables and to verify the structure of the measurement model. Based on theoretical foundations and empirical data, CFA determines which observed variables are associated with which latent factors

and examines the correlations among factors. Factor analysis includes two types: exploratory and confirmatory. In exploratory factor analysis, the factor structure is unknown and no prior assumptions are imposed, whereas in confirmatory factor analysis, the number of factors and their relationships are specified in advance, and the objective is to confirm a predefined factor structure.

Figure 1 illustrates the confirmatory factor analysis and structural equation model in the standardized coefficient estimation mode.

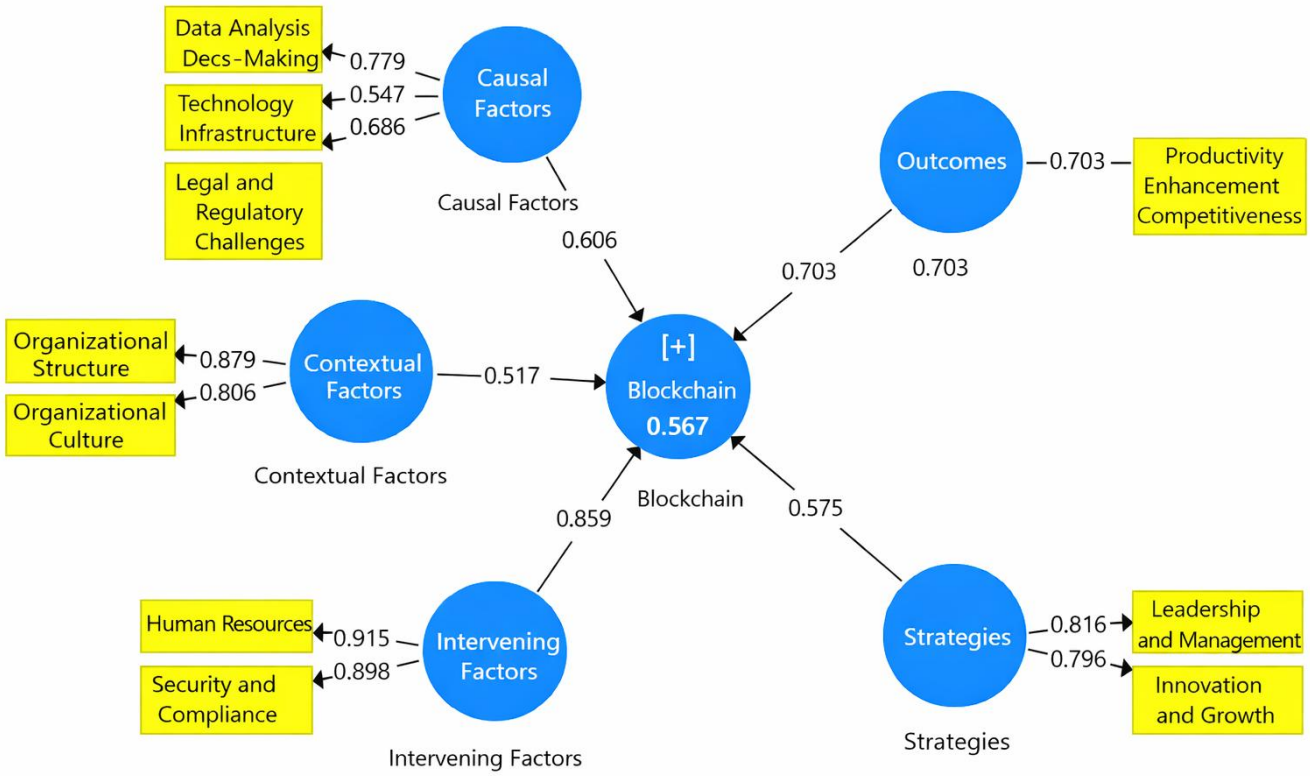

Figure 1. Model with Standardized Coefficient Estimation

In this figure, blockchain (with a coefficient of determination of 0.567) is considered the central variable of the model and is influenced by causal, contextual, and intervening factors. Intervening factors exert the strongest effect on blockchain (0.859), followed by causal factors (0.606) and contextual factors (0.517). Blockchain has a significant positive effect on outcomes (productivity enhancement) and strategies (leadership and innovation). All sub-variables exhibit factor loadings above 0.70, indicating satisfactory validity of the measurement indicators. Overall, the model demonstrates that blockchain technology is influenced by multiple dimensions and, in turn, contributes to the improvement of outcomes and innovative accounting strategies. The magnitude of each path and indicator effect is quantitatively specified through factor loadings and path coefficients, supporting the overall validity of the model.

In this diagram, the numerical coefficients are divided into two categories. The first category consists of measurement equations, which represent the relationships between latent variables (main constructs) and observed variables (questionnaire items), depicted as relationships between ellipses and rectangles. These equations are referred to as factor loadings.

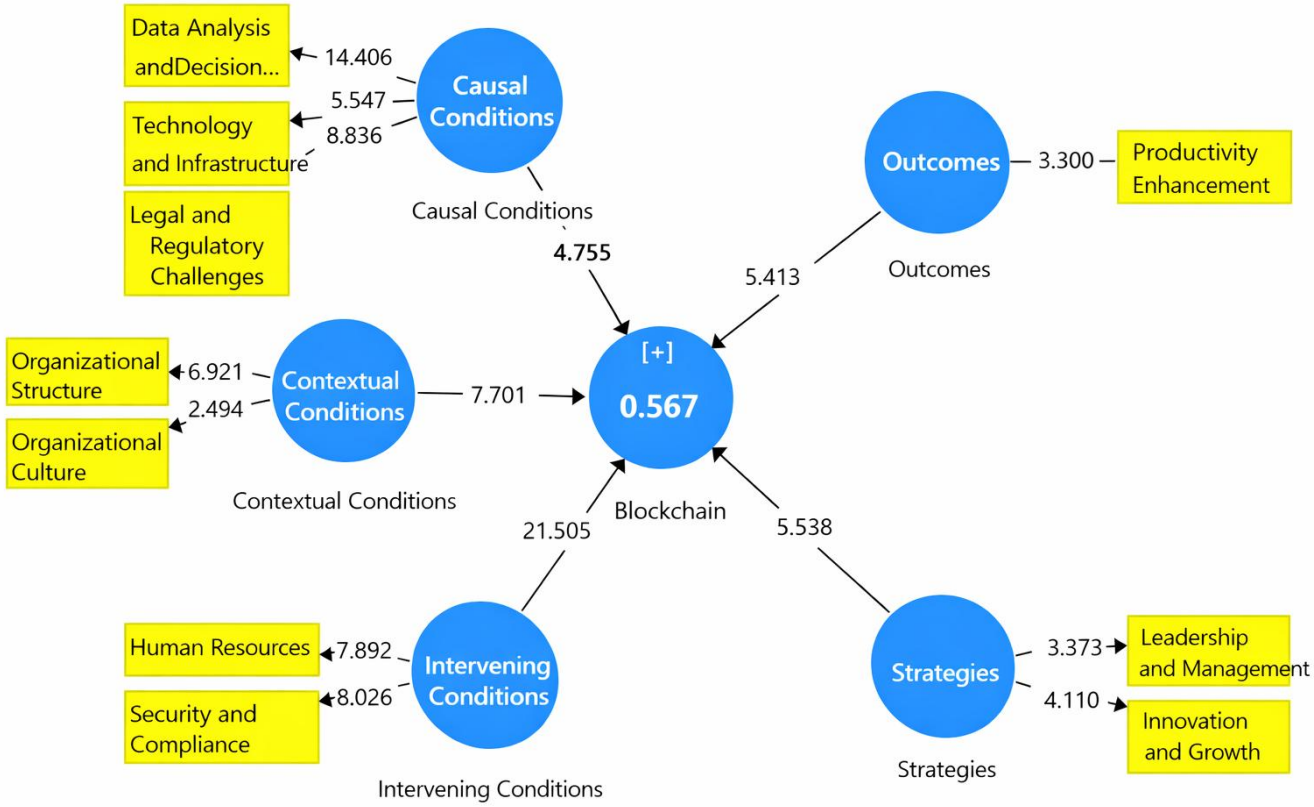

Figure 2. Model with Significance Coefficient Estimation

The model proposed in this study clearly demonstrates that successful implementation of blockchain technology in the field of innovative accounting is not merely a technological process but rather depends on a multidimensional set of human, managerial, structural, and security-related factors. Among these, intervening factors such as human resources and information security account for approximately 43.5% of the total effect and exert the greatest influence on this process. This indicates that even when appropriate technological infrastructure is available, the absence of skilled human capital and a secure information environment can hinder the effective adoption and implementation of blockchain.

Subsequently, contextual factors such as organizational structure and prevailing culture, with a contribution of 15.6%, play a significant role in creating a supportive environment for technological change. This finding suggests that transforming organizational culture and revising traditional structures are essential prerequisites for digital transformation in accounting.

Organizational strategies, including leadership, management, and innovation, also account for a substantial effect of 13.2% in shaping the technology adoption pathway. This highlights the critical role of top-level decision-making and managerial commitment in supporting emerging technologies and driving organizational transformation.

The second category comprises structural equations, which represent the relationships among latent variables and are referred to as path coefficients. These coefficients are used to test the research hypotheses. All measurement equations (factor loadings) and structural equations (path coefficients) are evaluated using the t-statistic. According to this model, a factor loading or path coefficient is considered statistically significant at the 95% confidence level if the t-value falls outside the range of −1.96 to +1.96, indicating a significant effect of variables on one another.

4. Discussion and Conclusion

The findings of this study provide a nuanced and empirically grounded understanding of how blockchain technology contributes to the development of innovative accounting practices through a multidimensional configuration of technological, organizational, managerial, human, and regulatory factors. Consistent with the grounded model derived from the data, the results demonstrate that blockchain adoption in accounting is not a linear or purely technological process, but rather a complex transformation shaped by interacting causal, contextual, intervening, strategic, and outcome-related conditions. This integrative perspective aligns with prior conceptual arguments that emphasize the socio-technical nature of blockchain-enabled accounting systems [4, 6].

One of the most salient findings of the study is the central role of data analysis and data-driven decision-making as causal conditions influencing innovative accounting practices. Participants consistently emphasized that blockchain's value lies not merely in data immutability, but in its capacity to generate analyzable, reliable, and real-time financial data that can support managerial and strategic decisions. This finding corroborates earlier research suggesting that blockchain transforms accounting from a record-keeping function into an analytical and decision-support system [5, 8]. The emphasis on technological KPIs, financial data analytics, and risk analysis within blockchain environments also supports the view that accountants' professional value increasingly depends on their ability to interpret and leverage data rather than simply produce reports [13, 19].

Closely related to this, the study highlights technology and infrastructure as another critical causal dimension. The findings show that blockchain adoption is highly contingent on complementary technologies such as artificial intelligence, big data analytics, cloud and edge computing, and secure server architectures. Participants repeatedly noted that blockchain in isolation offers limited operational benefits, a point strongly supported in the literature on blockchain ecosystems [2, 7]. This reinforces the argument that blockchain should be understood as part of a broader digital infrastructure rather than a standalone solution [18, 21]. The importance attributed to APIs, real-time processing capabilities, and intrusion detection systems further aligns with studies emphasizing that technological maturity and system integration are prerequisites for realizing blockchain's accounting benefits [6, 8].

The legal and regulatory challenges identified as causal conditions represent one of the most context-sensitive contributions of this study. Participants described legal ambiguity, regulatory delays, and the absence of a clear supervisory authority as major inhibitors of blockchain-based accounting innovation. These findings are consistent with Iranian-focused studies that highlight regulatory conservatism and legal uncertainty as structural barriers to emerging technologies [11, 16]. At the same time, they extend international discussions by showing how conflicts between blockchain transparency and confidentiality requirements create unique tensions in financial reporting and auditing contexts [1, 4]. This suggests that without adaptive legal frameworks, the transformative potential of blockchain may remain underutilized despite technological readiness.

At the contextual level, organizational structure and culture emerged as foundational conditions shaping blockchain adoption and innovation. The results indicate that decentralized, flexible, and participatory structures facilitate experimentation, cross-functional collaboration, and faster decision-making, which are essential for blockchain-based innovation. This aligns with innovation management literature emphasizing the role of structural flexibility in digital transformation [3, 9]. Similarly, the prominence of learning culture, trust, tolerance for technological errors, and constructive feedback echoes findings that organizational culture is a key determinant of innovation sustainability in accounting environments [13, 24]. The emphasis on accepting failure as part of learning

is particularly notable, as it reflects a shift away from risk-averse accounting cultures toward more adaptive and innovation-oriented mindsets.

Intervening conditions, especially human resources, training, and security, were found to exert the strongest influence on blockchain implementation. The dominant role of these factors underscores that even with favorable infrastructure and strategy, blockchain adoption can fail in the absence of skilled personnel and robust information security. This finding strongly supports studies that identify skill gaps and technostress as major obstacles to blockchain acceptance among accounting professionals [13, 15]. The emphasis on hybrid skills—combining accounting expertise with cryptography, distributed ledger technology, and data analytics—resonates with arguments that the accountant of the future must operate at the intersection of finance and technology [8, 19]. Moreover, the centrality of cybersecurity, encryption, access control, and privacy aligns with auditing-focused research that views security as a prerequisite for trust in blockchain-based systems [11, 12].

From a strategic perspective, leadership and management were identified as key mechanisms translating readiness into action. The findings show that transformational leadership, managerial vision, and data-driven decision-making play a decisive role in legitimizing blockchain initiatives and mobilizing organizational resources. This is consistent with prior research demonstrating that managerial commitment and strategic orientation significantly influence technology adoption outcomes in accounting and auditing [10, 14]. The study further illustrates that perceiving blockchain as an opportunity rather than a threat shapes organizational narratives and reduces resistance to change, echoing innovation diffusion arguments in the accounting literature [3, 4].

The outcomes identified in the model—namely productivity enhancement, competitiveness, transparency, and improved audit quality—confirm many of the benefits proposed in earlier conceptual and empirical studies. Automation of processes, reduction of human error, and increased accuracy in financial reporting directly reflect blockchain's technical affordances discussed in prior research [1, 2]. However, this study adds depth by showing that these outcomes materialize only when strategic, human, and contextual conditions are aligned. In this sense, the findings support the argument that blockchain's impact on accounting is contingent rather than deterministic [6, 20]. Importantly, the elevation of accountants' professional status and their transition toward more analytical and advisory roles reinforce claims that blockchain can redefine the accounting profession rather than render it obsolete [5, 8].

Overall, the discussion of results suggests that blockchain-enabled innovative accounting should be conceptualized as a multidimensional transformation process rather than a discrete technological upgrade. By empirically integrating causal conditions, contextual foundations, intervening mechanisms, strategic responses, and organizational outcomes, the grounded model developed in this study responds to calls for more holistic and context-sensitive frameworks in blockchain accounting research [6, 23]. This contribution is particularly valuable in the Iranian context, where institutional complexity, regulatory uncertainty, and skill mismatches pose distinctive challenges to digital transformation [16, 22].

Despite its contributions, this study has several limitations that should be acknowledged. First, the qualitative and grounded nature of the research, while providing depth and contextual richness, limits the generalizability of the findings beyond companies listed on the Tehran Stock Exchange. Second, the study relies on self-reported perceptions of experts, which may be influenced by personal experiences, organizational interests, or optimism toward emerging technologies. Third, although efforts were made to include diverse professional roles, the perspectives of regulators and standard-setting bodies were not directly examined, which may have constrained the analysis of legal and institutional dynamics.

Future research could build on this study by empirically testing the proposed conceptual model using quantitative or mixed-method approaches to assess the strength and direction of relationships among variables. Comparative studies across different countries or regulatory regimes would also be valuable in identifying how institutional contexts shape blockchain adoption in accounting. In addition, longitudinal research could examine how accountants' skills, organizational culture, and governance structures evolve over time as blockchain technologies mature and diffuse more widely.

For practitioners, the findings suggest that investing solely in blockchain technology without parallel attention to human capital, organizational culture, and security infrastructure is unlikely to yield sustainable benefits. Organizations should prioritize continuous training, interdisciplinary skill development, and leadership-driven change management alongside technological deployment. Policymakers and professional bodies can use the insights of this study to design supportive legal frameworks, update accounting education curricula, and promote pilot projects that reduce uncertainty and accelerate learning in blockchain-based accounting environments.

Authors' Contributions

Authors equally contributed to this article.

Ethical Considerations

All procedures performed in this study were under the ethical standards.

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Conflict of Interest

The authors report no conflict of interest.

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