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The impact of blockchain-based transparency on cloud business intelligence performance: The mediating role of real-time visibility

Sahar Mohammad Abu Bakir[a], Fawwaz Tawfiq Awamleh[a*] and Besan Zeyad Ahmad[b]

[a]*College of Business, Department of Business Administration, Amman Arab University, Amman, Jordan*
[b]*Department of Community Medicine, Faculty of Medicine, University of Jordan, Amman, Jordan*

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A B S T R A C T

This research aims to evaluate the performance measures of cloud business intelligence (BI) systems facilitated by blockchain transparency, as well as to explore the role of real-time visibility as a mediator in Jordanian commercial banks. To accomplish its objectives, this research chose twelve commercial banks in Jordan, and it gathered its data from 356 participants belonging to the highest hierarchy levels, such as executives and senior management, divided into information technology, risk, and operations units. Partial least squares structural equation modeling (PLS-SEM) was adopted for the evaluation of the measurement model, as well as for the assessment of the postulated mediation hypotheses, mainly for its strengths in predictions and sophisticated models. There is evidence suggesting that the implemented transparency from blockchain technology increases the effectiveness of cloud business intelligence (BI), for which real-time visibility functions as an important determinant in this advancement and works as a partial mediator for its effects. These findings indicate that implementing blockchain technology aspects for cloud business intelligence (BI) improves data reliability, availability, and timeliness, which can empower financial organizations to develop more accurate and applicable final insights. The major contribution of this research study is in its representation of empirical work carried out in the financial setting for the economy of Jordan, which explicitly verifies the role of blockchain-based transparency for improving the performance capabilities of cloud business intelligence (BI) via real-time visibility.

1. Introduction

Today, many existing research on cloud business intelligence (BI) or novel digital technologies has emphasized several challenges that make them impractical or of little value (Hamidinava et al., 2023). Most of the previous research works focused only on the technical aspect of cloud BI or digital technology adoption without considering the performance results (Alzahrani et al., 2022; Mahar et al., 2025). More specifically, they neglected the transparency mechanism's effect on decision-making or organizational intelligence (Hamidinava et al., 2023). Additionally, existing research works considered cloud BI systems independently without considering that cloud systems depend on the integrity of the information (Alayed & Awamleh, 2025; Almajali et al., 2025; Hamidinava et al., 2023). The absence of reliable information sources was already noted as a weakness of cloud systems (Islam & Hasan, 2023). It negatively impacts the result of the analysis (Kumar, 2022). Indeed, several existing empirical research works considered cloud BI or digital systems limited by traditional governance or security models without considering the absence of these models in cloud computing (Islam & Hasan, 2023). The existing method seems to be limited because most of these works considered linear models (Khawaldeh et al., 2025). Those models cannot capture complex relationships properly. The real-time dynamics of information were not considered because they were assumed or simplified (Hamidinava et al., 2023).

* Corresponding author
E-mail address: f.awamleh@aau.edu.jo (F. T. Awamleh)

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Despite the increased amount of existing publications, there is still a distinct research gap concerning the joint impact of transparency provided via blockchain and cloud BI performance (Khawaldeh et al., 2025). Previous investigations on blockchain and cloud BI performance were mainly conducted in a separate manner, without proper consideration of their interaction effects (Popović et al., 2022). The mechanisms of transparency in blockchain, which work as mediators to improve BI performance, still need to be uncovered (Jiang et al., 2025). Specifically, the role of real-time visibility is conceptually validated but rarely investigated in real-world environments (Jiang et al., 2025; Khawaldeh et al., 2025). In addition, the vast majority of the existing literature on this issue is still limited to developed countries, while emerging markets receive inadequate representation (Paramesha et al., 2024). The banking industry, which is highly sensitive to data privacy and has strict regulations, is not suitably investigated empirically (Xu et al., 2022). There is also a gap in the investigations conducted via state-of-the-art analytical methods that can effectively address the impact of mediation effects (Jamadade et al., 2025).

In summary, the current literature still lacks a unified explanation of how transparency and BI performance interact to achieve improved BI performance. As such, this proposed study specifically intends to investigate and explore the effect of transparency on cloud business intelligence performance, specifically using blockchain as its topic of study. It also intends to explore whether and how real-time visibility can act as a mediator within this context. This study specifically focuses on commercial banks operating in Jordan to provide empirical data in a new and emerging financial context. It would also provide decision-makers with useful and relevant information on transparency as a factor affected by technological advancements.

2. Theoretical Framework and Hypotheses Development

2.1 Blockchain-Based Transparency

On theoretical grounds, blockchain transparency is related to the information transparency theory and trust theory, wherein the quality of information is recognized as a key driver for reducing ambiguity in the organizational environment (Popović et al., 2022; Xu et al., 2022). In fact, the concept of blockchain helps introduce an immutable and decentralized record, which works towards reducing any kind of manipulation in the information, along with enhancing the auditing mechanism in the cloud-based environment (Popović et al., 2022; Xu et al., 2022). The immutable feature enhances the levels of governance mechanisms for the datasets, as it is made uniform in terms of its integrity (Popović et al., 2022). On theoretical grounds, it can be assumed that the transparent environment related to datasets helps suppress inequality in terms of information among the stakeholders of the organizational environment, which, in turn, helps improve coordination and control in the organizational environment (Obermeier, 2025). This theoretical aspect of blockchain is also related to RBV theory, where quality information recognized as trustworthy performs the role of the organizational asset (Obermeier, 2025; Popović et al., 2022).

2.2 Real-Time Visibility

From a theoretical point of view, the concept of real-time visibility is underpinned by dynamic capability theory, as it emphasizes the sensing, seizing, and responding capacities of the organization as it responds to dynamic environments (Dolgui & Ivanov, 2022). Having real-time access to the data enables the organization to monitor their processes and adapt its strategies as a result (Dolgui & Ivanov, 2022; Wycislak, 2023). Adopting a theoretical approach based on information-processing theory, real-time visibility enables the organization's capacity to process high-velocity information to be increased (Wycislak, 2022). Together with the aspect of transparency provided by the application of blockchain technology, real-time visibility enables the organization to ensure that the instantaneous access of information does not result in decreased accuracy (Wycislak, 2022). Adopting a theoretical stance, the application of the two technologies enables the organization's capacity to sense the environment and predict actions regarding their situations, shifting the focus from a reactive model to a proactive model (Dolgui & Ivanov, 2022). Regarding the concept of agility, having real-time visibility enables the organization's capacity to modify its performance at a faster pace (Dolgui & Ivanov, 2022; Wycislak, 2022, 2023).

2.3 Cloud Business Intelligence Performance

From a theoretical perspective, the performance of cloud business intelligence systems can be explained using the theory of decision support systems (Kumar, 2022). This is because the usefulness of analytical solutions in business decision-making is highlighted by this theory (Alayed & Awamleh, 2025). In obtaining beneficial information and knowledge, cloud business intelligence systems with high performance require precise and valid information (Alayed & Awamleh, 2025). Using the socio-technical systems theory, the performance of cloud business intelligence systems is achieved by ensuring alignment between the technological platform and information quality (F. Awamleh & Ertugan, 2021; F. T. Awamleh, Bustami, et al., 2024). Information environments that are transparent and consist of real-time information are associated with higher accuracy of information analysis and a lack of ambiguities in the interpretation of results (Islam & Hasan, 2023). This implies that, according to contingency theory, cloud business intelligence system performance is dependent on the alignment of data analysis tools and business needs (Hamidinava et al., 2023).

2.4 Hypotheses Development

2.4.1 Blockchain-Based Transparency and Cloud Business Intelligence Performance

The existing literature strongly recommends that data integrity and its trustworthy nature play a crucial role in the performance of cloud business intelligence (Obermeier, 2025). Although manipulating and processing data in the cloud environment through cloud analytics has improved, the drawbacks in manipulation, consistency, and traceability still exist (Almajali et al., 2025). Blockchain transparency in data processing has improved the integrity of data by using unchangeable and auditable data management in the cloud environment (Maaitah, 2023; Tsiu et al., 2025). Although the existing literature confirms the technological benefit provided by the use of blockchain technology, the empirical evidence concerning the effect of blockchain transparency on the performance result of cloud business intelligence has not been explicitly tested and evaluated (Popović et al., 2022). It can be rationally stated that the use of trustworthy data in the analysis system will enhance the validity and usefulness of the respective outcomes, thus improving the performance result of business intelligence (F. T. Awamleh, Bustami, et al., 2024; Tsiu et al., 2025). Based on the stated argument, the following hypothesis was developed:

H_1: *Blockchain-based transparency positively impacts cloud business intelligence performance.*

2.4.2 Blockchain-Based Transparency and Real-Time Visibility

Having real-time visibility has become even more important for today's dynamic and data-driven cloud environment (Dolgui & Ivanov, 2022, 2022). The traditional centralized data model, on the other hand, always encounters latency issues, late updates, and unsynced processes, making it difficult for an organization to have real-time data (Dolgui & Ivanov, 2022). The transparent decentralized model of blockchain technology ensures constant data verification and synchronized data updates among different nodes, thus preventing data latency issues (Dolgui & Ivanov, 2022). Even though blockchain technology is traditionally used for transparency and trust building, there is a lack of theoretical and practical knowledge about how blockchain technology helps in having real-time visibility in a cloud computing environment (Jiang et al., 2025). This highlights that there is a need to explore whether the transparency provided by blockchain technology is effective enough to cater to real-time data access/monitoring. Based on the above logic, we conclude the following hypothesis:

H_2: *Blockchain-based transparency positively impacts real-time visibility.*

2.4.3 Real-Time Visibility and Cloud Business Intelligence Performance

Cloud-based business intelligence solutions enable managerial decision-making processes by offering valuable information in a timely, accurate, and relevant manner (Islam & Hasan, 2023). Nonetheless, organizations still adopt the strategy of data update intervals, hindering the process of business intelligence systems in effectively considering the actual organizational reality of the present moment (Hamidinava et al., 2023; Kumar, 2022). Real-time data, therefore, overcomes such a problem in cloud computing by allowing the acquisition of data in a continuous process and instant processing of the data for analysis (Dolgui & Ivanov, 2022; Wycislak, 2022). Although the need for the application of real-time data in cloud computing-based business intelligence systems is well realized, the existing literature only explored the topic in the context of its technical architecture (Wycislak, 2022, 2023).

From a theoretical point of view, real-time visibility leads to increased information processing power and decreased time for making decisions, which are essential for highly efficient analytical systems (Dolgui & Ivanov, 2022; Wycislak, 2022). With current information available to the decision-maker, they are able to make quick and correct decisions, keeping with the overall business goal (Islam & Hasan, 2023; Maaitah, 2023). Also, real-time visibility enables the transition from descriptive and diagnostic analytics to proactive analytics (Tsiu et al., 2025). Logically, the above reasons enable highly efficient performance of the cloud-based business intelligence solution, and the following hypothesis is developed:

H_3: Real-time visibility positively impacts cloud business intelligence performance.

2.4.4 The Mediating Role of Real-Time Visibility

Such transparency offered by blockchain technology can even increase the credibility of cloud data by providing immutability, traceability, and verifiable data (Obermeier, 2025). However, the mere aspect of transparency cannot lead to better performance regarding business intelligence (Wycislak, 2023). Credible data that isn't easily attainable can even lack strategic significance, which may specifically occur when business intelligence processes gather data at a rapid pace (Dolgui & Ivanov, 2022; Khawaldeh et al., 2025). A prevailing gap exists as researchers fail to consider the processes and approaches that work between the two variables of blockchain transparency and cloud business intelligence performance (Alayed & Awamleh, 2025; Wycislak, 2023). Having a transparent process in the cloud via blockchain increases the credibility of data through the assurance of its immutability, traceability, and verifiability (Alayed & Awamleh, 2025; Dolgui & Ivanov, 2022). The

advantages of the transparent process in cloud data will not have any impacts on the performance of the data in cloud BI (Jamadade et al., 2025). Effective data that is not directly available and obtainable, especially in situations demanding speedy action, will have no value (Khawaldeh et al., 2025). The gap in the theoretical framework regarding the processes in making the transparent data perform in cloud BI mediums (Khawaldeh et al., 2025).

Indeed, real-time visibility is a key enabling factor that closes this gap by ensuring that transparency is exploited during decision-making (Alayed & Awamleh, 2025). The utilization of real-time availability of verified blockchain-based information increases the effect weight of transparency dimensioning the effectiveness of analyses (Dolgui & Ivanov, 2022; Obermeier, 2025). The role played by real-time visibility is consistent with information value theory as well as theories of dynamic capabilities (Dolgui & Ivanov, 2022). Logically, transparency based on blockchain implies improved information reliability (Paramesha et al., 2024). However, the timely utilization of this information implies improved cloud BI system performance(Xu et al., 2022). The hypothesis developed based on this logic is as follows:

H_4: *Real-time visibility mediates the relationship between blockchain-based transparency and cloud business intelligence performance.*

3. Methodology

3.1 Research Design

This research employs a quantitative design, utilizing the cross-sectional survey method to empirically validate the proposed research model that tests the relationships between Blockchain-Based Transparency (BBT), Real-Time Visibility (RTV), and Cloud Business Intelligence Performance (CBIP). The quantitative approach is more effective in testing causal relationships between latent constructs and validating theoretical research models in technology-intensive settings. With the presence of mediating effects and complexity in the proposed model, PLS-SEM is the major data analysis technique using SmartPLS 4 software. PLS-SEM is more appropriate in this research work because of its abilities in dealing with complex research models, predictive research purposes, and the presence of non-normal distributions of data. This proposed research model places real-time visibility as the mediating variable between blockchain-based transparency and cloud business intelligence performance (Simester et al., 2025).

3.2 Population and Sample

The research targets managers/professionals working within 12 commercial banks in Jordan who rely on cloud business intelligence systems as well as blockchain data management solutions. The research targets businesses operating within high data volume industries that require real-time business intelligence solutions. The non-probability method of purposive sampling was used to collect data from participants who have adequate knowledge and experience pertaining to blockchain technology, cloud solutions, and business intelligence systems. These participants were limited to IT managers, cloud architecture personnel, data analysts, business intelligence managers, digital transformation managers, and key decision-makers within banks. Data was collected through an online survey that was done through formal bank communication channels. A total of 356 questionnaire forms were used to collect the data, and all the responses obtained were filtered to see if they contained complete and consistent data that was suitable for analysis. Thereafter, it was revealed that the data collected was adequate for analysis using PLS-SEM techniques (Simester et al., 2025).

3.3 Measurement and Instrument Design

The data was obtained using a structured design of the questionnaire, which was specially designed for testing the constructs within the proposed study. Regarding the testing of the measurement statements, a five-point Likert scale was employed. The responses used a scale from "strongly disagree" (1) to "strongly agree" (5). It was proposed that the design of individual questions be suited to either the organizational context, technological context, cloud business intelligence, or use of blockchain. Blockchain-based transparency was evaluated by using statements to assess the extent to which the use of blockchain technology delivers data integrity, traceability, security, and data reliability in the cloud-based system (Jiang et al., 2025; Obermeier, 2025; Popović et al., 2022). Real-time visibility was evaluated by using statements that assess the instant access, monitoring, and evaluation of data in the cloud-based system. It encompasses the immediacy, precision, and data accessibility for decision-makers in the organizations (Dolgui & Ivanov, 2022; Wycislak, 2022, 2023). Cloud Business Intelligence performance was evaluated by using statements to assess the performance of the cloud-based business intelligence systems in accommodating decision-makers to gain timely, accurate, and practical information through analysis (Hamidinava et al., 2023, 2023; Islam & Hasan, 2023).

3.4 Data Collection Procedures

(Al-Kharabsheh & Awamleh, 2025)The questionnaire was administered online using the company's recognized, secure internal email networks to ensure confidentiality and data safety(Popović et al., 2022) . Despite the detailed information provided through posters online and by mail, prior consent was requested as required by the ethics of research design (Jiang et al., 2025). A follow-up reminder was sent one week after the initial distribution of the questionnaire to encourage feedback and boost response rates (Al-Kharabsheh & Awamleh, 2025). Before the final data is analyzed, the replies are filtered to ensure they are free of gaps and do not present contradictions (Al-Kharabsheh & Awamleh, 2025). No data would appear in the final findings that had gaps or discrepancies in the replies (Wycislak, 2023).

3.5 Pilot Study

A pilot study was conducted before the larger survey to determine the clarity, reliability, and content validity of the measurement tool. For the pilot test, 30 participants were chosen, and all were from the same kind of organizations that were chosen for the full research study. The participants were eligible for the research using the same criteria as the full study. The participants had the right knowledge pertinent to cloud business intelligence and blockchain technology. Findings from the pilot research were used to enhance the research questions and the overall research design. Reliability analysis carried out on the research indicated that all factors measured contained the right level of internal consistency (Simester et al., 2025).

3.6 Data Analysis

The data analysis was done using the SmartPLS 4 software. The process involved a two-step procedure. The first step was the analysis of the measurement model to verify the construct reliability, construct validity, and discriminant validity. The construct reliability was verified by using the composite reliability method. The construct validity was verified by using the Average Variance Extracted (AVE) method. In addition, the discriminant validity was verified. The next procedure is the validation of the model parameter values. The parameter values include the path value, t-value, and p-value. The models used a bootstrap technique with 5,000 resamples. The mediating analysis used the indirect analysis procedure with the real-time visibility construct. Besides, the fitness features are used to verify the model's fitness (Hair et al., 2025; Sarstedt et al., 2024).

4. Results and Analysis

Table 1
Demographic Characteristics of the Sample

Category	Frequency	Percentage (%)
Gender (Male)	286	67.5
Gender (Female)	138	32.5
Age (25–34 years)	112	26.4
Age (35–44 years)	187	44.1
Age (45 years and above)	125	29.5
Managerial Level (Junior)	173	40.8
Managerial Level (Senior)	251	59.2
Experience (5–10 years)	164	38.7
Experience (More than 10 years)	260	61.3

As can be seen from Table 1, the purpose of the table is to present the demographic description of the participants for the particular research study that has been carried out. The sampling is mainly dominated by the masculine side of participants, which generally conforms to the management aspect adopted within technology-intensive sectors. The participants are mostly within the 35-44 age group and have over a decade’s worth of professional working experience, thereby establishing expert sampling for the research study. Furthermore, the majority of the participants are employees at the managed level, which helps to justify the research study, as the participants are actively engaged about decision-making associated with blockchain technology systems, cloud computing systems, and the usage of BI (Hair et al., 2025).

Table 2
Descriptive Statistics of Study Variables

Construct	Mean	Standard Deviation
Blockchain-Based Transparency	4.12	0.63
Real-Time Visibility	4.05	0.68
Cloud Business Intelligence Performance	4.18	0.59

The descriptive statistics for the variables of the study appear in Table 2 below. The mean score for each variable exceeds 4.00, and this indicates a high level of agreement among the respondents regarding the significance and occurrence of blockchain-based transparency and cloud BI performance. Additionally, the low standard deviations for the variables mean

that there is a high level of uniformity among the perceptions held by the respondents and, hence, the reliability of the data (Hair et al., 2025).

Table 3
Reliability and Validity Analysis of Constructs

Construct	Code	Measurement Item	Loading	Alpha	CR	AVE
Blockchain-Based Transparency (BBT)	BBT1	Records are tamper-resistant.	0.83	0.89	0.92	0.71
	BBT2	Data provenance is verifiable.	0.86			
	BBT3	Transactions are fully traceable.	0.84			
	BBT4	Updates are auditable end-to-end.	0.85			
	BBT5	Shared data is consistently trusted.	0.82			
Real-Time Visibility (RTV)	RTV1	We access live operational data.	0.84	0.87	0.91	0.69
	RTV2	Dashboards update continuously.	0.83			
	RTV3	Alerts reflect events instantly.	0.86			
Cloud BI Performance (CBIP)	CBIP1	BI insights are accurate.	0.87	0.91	0.93	0.74
	CBIP2	Reports are generated quickly.	0.88			
	CBIP3	Analytics improves decision quality.	0.85			
	CBIP4	The platform scales reliably.	0.86			
	CBIP5	BI supports timely actions.	0.84			

Table 3 outlines the reliability and convergent validity results for the constructs of the study. Internal consistency is confirmed by the values for composite reliability, which all ran from 0.91 to 0.93, along with the values for Cronbach's Alpha, which ran from 0.87 to 0.91. Additionally, all outer loadings exceeded 0.82, which confirmed the sufficient reliability for the indicator. The AVE values, which ran from 0.69 to 0.74, also exceeded the set 0.50 benchmarks. Consequently, all the above imply sufficient convergent validity and reliability for the measurement model, which allows for the subsequent analysis for the structural model using SmartPLS 4 (Hair et al., 2025).

Table 4
Discriminant Validity (Fornell–Larcker Criterion)

Construct	BBT	RTV	CBIP
Blockchain-Based Transparency (BBT)	0.84		
Real-Time Visibility (RTV)	0.62	0.83	
Cloud Business Intelligence Performance (CBIP)	0.58	0.65	0.86

As presented in Table 4, the discriminant validity test results are obtained using the Fornell and Larcker criterion. The square roots of the average variance extracted (AVE) of each construct—namely, Blockchain-Based Transparency (0.84), Real-Time Visibility (0.83), and Cloud Business Intelligence Performance (0.86)—are ALL greater than the corresponding correlations among the constructs. Indeed, the correlations are as follows: the correlation between blockchain-based transparency and real-time visibility is 0.62, while the correlation between blockchain-based transparency and cloud business intelligence performance is 0.58. Both are less than the respective AVE values' square roots. Similarly, the correlation of 0.65, being less than the square roots of the AVE values of Real-Time Visibility (0.83) and Cloud Business Intelligence Performance (0.86), confirms the same. Thus, the results confirm the empirical separateness of each variable and hence confirm the criteria of the measurement model's discriminant validity (Hair et al., 2025).

Table 5
Path Analysis Results for Direct Hypotheses Testing

Hypothesis	Path	β	t-value	p-value	Result
H_1	BBT → CBIP	0.31	5.82	<0.001	Supported
H_2	BBT → RTV	0.54	9.47	<0.001	Supported
H_3	RTV → CBIP	0.43	7.96	<0.001	Supported

The results of the direct path analysis, used to test the hypotheses, are given in Table 5 and Fig. 1. The results indicate a significant and positive effect of blockchain-based transparency on cloud business intelligence performance ($\beta = 0.31$, $t = 5.82$, $p < 0.001$), thus supporting H1. Additionally, the blockchain-based transparency impacts real-time visibility ($\beta = 0.54$, $t = 9.47$, $p < 0.001$) significantly, thus supporting H2. Finally, real-time visibility is effective in improving cloud business intelligence performance ($\beta = 0.43$, $t = 7.96$, $p < 0.001$), thus supporting H3. The model is significant (Hair et al., 2025; Sarstedt et al., 2024).

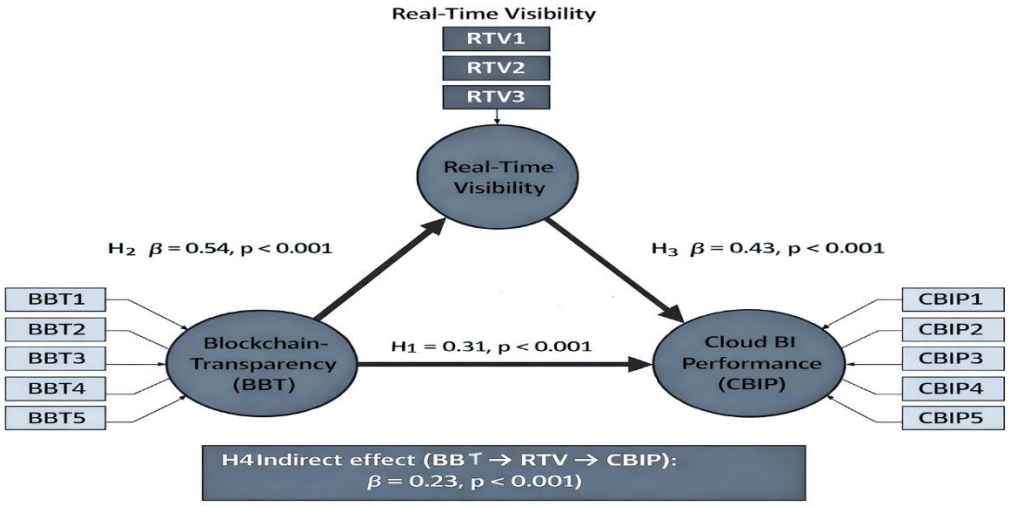

Fig. 1. Depicts the conceptual framework of the research

Table 6
Mediation Analysis Results

Path	Indirect Effect (β)	t-value	p-value	Mediation Type
BBT → RTV → CBIP	0.23	6.14	<0.001	Partial Mediation

Table 6 shows the result of conducting the mediation test, where the indirect effect of blockchain-based transparency on cloud business intelligence performance through the mediation of real-time visibility is measured. The positive sign of the indirect effect ($\beta = 0.23$, $t = 6.14$, $p < 0.001$) indicates a strong mediating process. Since the direct relationship between the two variables, blockchain-based transparency and cloud business intelligence performance, remains strong despite the mediating process of real-time visibility, the type of mediation process is partial (Hair et al., 2025; Sarstedt et al., 2024).

Table 7
Model Fit Indices

Index	Value	Threshold
SRMR	0.062	< 0.08
NFI	0.91	> 0.90
Chi-square/df	2.34	< 3.00

The summary of the indices of fit of the proposed model is presented in Table 7. The value of the SRMR, which is less than the cutoff limit of 0.08, indicates a good fit of the proposed model. Additionally, the NFI, whose value exceeds the cutoff limit of 0.90, confirms the validity of the proposed model. Moreover, the ratio of the chi-square to df, whose value is acceptable, confirms that the proposed model fits satisfactorily (Hair et al., 2025; Sarstedt et al., 2024).

5. Discussion

The study shows that transparency between the data integrity, traceability, and accuracy of analysis provided by blockchain technology positively impacts the performance of business intelligence over a cloud infrastructure. This study supports the idea that reliable data is a key factor in high-performance data analysis within a cloud infrastructure (F. T. Awamleh, Bustami, et al., 2024; Paramesha et al., 2024). On a different scale, it has been discovered that, although there is an implementation of blockchain technology, there is no guarantee for increased performance; rather, it is dependent on the particular level of digital maturity of an organization and system integration skills (Kumar, 2022; Tsiu et al., 2025). Additionally, the transparency provided by blockchain technology within an organization may have limitations that could impact its effectiveness in business intelligence (Popović et al., 2022). These factors demonstrate that although blockchain technology has significant potential for enhancing transparency, the effectiveness of this transparency in relation to business intelligence is contingent upon appropriate governance infrastructure and technological factors within an organization (Awamleh, Alzghoul, et al., 2024; Jiang et al., 2025; Popović et al., 2022). Therefore, within these aspects, there is a need for an alignment between blockchain technology implementation and an organization's specific aims for business intelligence (Almajali et al., 2025; Maaitah, 2023).

The fact that blockchain possesses the attribute of transparency, in addition to the benefit of real-time visibility, accentuates the importance of the validity of data by a decentralized system in rapidly providing accurate information. The system upgrades the visibility of a business in a cloud system by minimizing information asymmetry and optimizing the process of information dissemination(Xu et al., 2022). Nevertheless, the existing research evidence points out that the processing capacity and time constraints pose critical technical challenges in the process of realizing rapid visibility for a system that adopts the use of Blockchain (Obermeier, 2025; Popović et al., 2022). As a result, unless the architecture of the system undergoes adjustments, the use of blockchain may face challenges in complying with the fast speed requirements of those systems that require instant updating of data (Paramesha et al., 2024; Popović et al., 2022). Furthermore, the effort to maintain systems in a state of instant visibility in a dispersed system contributes to magnified system costs and system complexity (Khawaldeh et al., 2025).

From the results obtained, it is also noted that the use of real-time visibility has an enhancing impact on the performance of cloud business intelligence. The use of real-time visibility allows an organization to move from a reactive state to a predictive or proactive state when making decisions (Almajali et al., 2025; Kumar, 2022; Paramesha et al., 2024). Conversely, contrary to the findings from recent research, it is noted that use of real-time visibility can lead to information overload, which affects the outcome of decisions (Almajali et al., 2025; Maaitah, 2023). This implies that use of real-time visibility depends on the validity of information produced (F. T. Awamleh et al., 2025). Unfortunately, this can be a problem for an organization that uses cloud services because of the high velocities (Paramesha et al., 2024). Moreover, it can be noted that total success concerning the use of real-time visibility on clouds can never be feasible because of increased infrastructural costs that come with its use (Kumar, 2022). Use of real-time visibility has an enhancing impact on cloud business intelligence; however, its success depends on proper data governance (Tsiu et al., 2025).

The transparency that is injected into the blockchain system enhances the performance of business intelligence in the cloud environment as a result of the capabilities linked to immediate action in relation to the potential of real-time transparency. The study makes the point that topical significance is linked in relation to the transformation of technical transparency into analytical insights (Popović et al., 2022). The topical literature available currently indicates that transparency does not play an imperative role in the enhancement of decision-making systems since the information has to be significant, in addition to its timely nature (Jiang et al., 2025; Paramesha et al., 2024; Popović et al., 2022). On the one hand, the mediating role is challenged by the emerging issues linked to an evolving nature of the laws of data protection, as well as the growing complexity linked to governance systems, in addition to an ongoing need for updates in the system (Obermeier, 2025).In some cases, a lack of adequate capabilities for immediate processing might weaken the mediating role's relation to performance (Xu et al., 2022; Jiang et al., 2025).

6. Conclusion

The proposed study aimed to investigate the effect of blockchain-based transparency on cloud business intelligence performance and verify the mediating effect of real-time visibility for Jordanian commercial banks. The findings of this study confirm that blockchain-based transparency has a positive and significant effect on cloud business intelligence performance and verify its role in improving data reliability and effectiveness. It was also found that blockchain-based transparency significantly increases real-time visibility by enabling immediate access, observation, and assessment of data. Additionally, it was found that real-time visibility has a positive and significant effect on cloud business intelligence performance by enabling swift and accurate decision-making. The outcome of the mediating test demonstrates that real-time visibility partially mediates the relationship between blockchain-based transparency and cloud business intelligence performance, confirming that blockchain transparency improves business intelligence performance in both direct and indirect ways by improving data visibility and clarity. In light of these findings and outcomes, it can be concluded that implementing blockchain-based transparency in cloud business intelligence systems improves analytical abilities and enables swift actions and better decision-making for financial institutions by leveraging data clarity and availability.

Notwithstanding its importance, this research has several limitations that are important to discuss. Firstly, the cross-sectional approach used limits the ability to develop cause-and-effect relationships or track the developing trends associated with the adoption of blockchain technology and cloud BI. In this case, using self-reported data can pose a risk concerning common method variance and limitations of perceptions, despite using statistical controls. The restriction of the sample population to organizations operating in data-intensive industries may limit generalization to other industries or smaller organizations with different technological capabilities. Finally, this research has limitations concerning the scope, as it ignores variables comprising organizational culture, regulatory factors, and technological readiness that may end up affecting the discovered relationships.

Future studies are therefore encouraged to consider longitudinal research designs in order to better investigate the causal impacts of the integration of blockchain technology with cloud business intelligence. Moreover, the generalizability of future studies could be improved by considering a broader focus of the studies across multiple industries and SMEs. This may be followed by future studies investigating the impacts of organizational cultures, governance structures, and environments on

the efficiency of the transparency provided by the application of blockchain technology. Additionally, there may be a need to investigate more advanced architecture designs, including hybrid off-chain designs, to improve the scalability and real-time data processing limitations of the current technology called for by future studies.

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