

Blockchain-enabled business intelligence for strategic agility in logistics information flows: the mediating role of data transparency

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Received: 09 Jan. 2026; Revised: 25 Jan. 2026; Accepted: 10 Feb. 2026<https://doi.org/10.22306/al.v13i3.801>**Blockchain-enabled business intelligence for strategic agility in logistics information flows: the mediating role of data transparency****Sally Shwawreh**Department of Digital Marketing, Amman Arab University, Al-Urdon St., Amman 11941, Jordan,
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TR-10 Mersin, 990 10, Turkey, ORCID 0000-0001-5753-6162, msagsan@eul.edu.tr**Keywords:** logistics information flows, blockchain-enabled business intelligence, data transparency, strategic agility, SMEs.**Abstract:** This study examines how blockchain-enabled business intelligence (BEBI) strengthens strategic agility by improving the integrity and visibility of organizational information flows in small and medium-sized enterprises (SMEs). The addressed problem is that SMEs operating in dynamic markets often rely on analytics built on fragmented and unverifiable data, which weakens the speed and reliability of strategic responses across logistics-relevant flows (information, financial, and human flows). Using a questionnaire survey of 372 senior and middle managers and structural equation modeling with SmartPLS 4, the study tests a model linking BEBI, data transparency, and strategic agility. The results indicate that BEBI positively influences strategic agility and data transparency, and that data transparency positively affects strategic agility. Moreover, data transparency partially mediates the relationship between BEBI and strategic agility. The novelty of the study is the integration of blockchain-based trusted data architecture with business intelligence to explain how transparent, traceable, and reliable data flows enable faster sensing and reconfiguration of resources, supporting agile strategic actions in SMEs.

1 Introduction

This study, therefore, investigates how to manage logistics-relevant flows—especially the flow or management of information, the flow or management of financial resources, and human flows—while responding to rapid market turbulence [1,2]. In SMEs, strategic agility depends on the ability to sense changes quickly and coordinate decisions using trustworthy data flows that are traceable, visible, and resilient to manipulation [3]. This study, therefore, investigates the impact of blockchain-enabled business intelligence on strategic agility and tests whether data transparency explains this relationship [4,5].

Even though there is an emerging trend of increasing research being carried out on blockchain technology or business intelligence, there remains a substantial research gap pertaining to the combined effects of blockchain technology and business intelligence on strategic agility [6,7]. Most of the previous research on this topic has been carried out to identify the effects of blockchain technology or business intelligence [8,9]. Furthermore, there is also a need to explore the possible mechanisms involving the employment of blockchain technology in the enhancement of strategic performance [10]. The employment of data transparency as a mediator on the employment of analytical systems and strategic agility has lacked significance in the present literature, particularly in the emerging economies in which SMEs operate [11,12]. The issue of blockchain-based business intelligence and strategic agility, with an emphasis on data transparency, addresses the challenges faced in the context of the current study [13]. This paper shall test the hypothesis that transparent and accurate data environments have an effect on the flexibility of strategic agility in the Jordanian SME context [14,15].

The paper proposes a framework concerning blockchain, business intelligence, and strategic agility to add more rigor to the existing literature. Guidelines shall be constructed concerning new data technology and the strategic decision-maker to gain a better competitive advantage within the context of dynamic business environments.

2 Literature review

2.1 Blockchain-enabled business intelligence

A business intelligence solution based on the application of blockchain technology represents an advanced analytical solution that applies the principles of blockchain technology to existing business intelligence solutions [1,4]. The business

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intelligence solution based on blockchain technology is meant to upgrade the security, integrity, and real-time analysis capabilities associated with business data in an organization [6,15]. The business intelligence solution based on blockchain technology is distinct from other business intelligence setups in the sense that it applies the immutability characteristics of blockchain technology to enable business operations in an organization to have a high level of integrity [10,16]. The solution enables organizations to generate genuine business intelligence that can assist in organizational strategic-level decisions. From a strategic point of view, business intelligence systems based on blockchain technology can assist an organization in detecting any form of business environmental change with the help of clean and untampered-with data flows in an organizational setup [9,13]. The business intelligence system based on blockchain technology can assist in synchronizing business units in an organization in relation to organizational operations in a dynamic business setup to a greater extent, thereby emerging as a distinct strategic tool for enabling organizations to make fast decisions in a dynamic business setup [16,17].

2.2 Data transparency

Data transparency refers to the extent to which information within an organization is accurate, accessible, traceable, and understandable to selected authorized persons [18]. In blockchain technology-based networks, transparency is created by distributed architectures of information, which present a community view of information transactions, leading to lowered uncertainties and increased confidence in information application [10,12]. Data transparency at higher levels encourages faster validation of information, improvement in cooperation and collaboration, and reliance on analysis findings for sound decision-making [4,17]. Decision makers will be more willing to use analytics when they are confident of the information's clarity and accuracy. Data transparency is, therefore, an important integration mechanism that ensures analytics tools are integrated into the success of the strategic action plan [19,20].

2.3 Strategic agility

It is pertinent to note that the application of strategic agility is considered a feature of an organization that perceives changes in the surrounding setting and responds accordingly to such changes [9]. Within the digital platforms, an individual or an organization with strategic agility depends on the presence of timely, credible, and accessible information [21]. The application of blockchain technology to strategic agility allows an organization to gain insight based on information from transparent and credible data [10,22]. Organizations with access to credible data, therefore, have the capacity to enhance decision-making processes related to strategies and responsiveness to changes in the marketplace. Strategic agility, therefore, depends on both technology capabilities and data management [13].

2.4 Hypothesis development

Blockchain business intelligence could be a paradigm shift in business intelligence because trusted data architecture can be integrated with advanced business intelligence [13,22]. This study assumes that the integration of blockchain technology will enable the accuracy and definiteness of data employed within the business environment [3]. The decision-maker will be poised to feel the changes in the business environment through the use of precise business data [4,13]. Business organizations can adjust quickly to the changes within the business environment. There shall be no delay in business decision-making, in which business organizations are discouraged from making quick decisions [17]. This study assumes that business organizations will be agile because they can make quick analyses on alternatives or means allocation [12]. Alignment within the business environment will be important because the study has been able to assume the following:

H1: Blockchain-enabled business intelligence has a positive impact on strategic agility.

Blockchain-based business intelligence has made a big impact on the transparency of data by combining the transparency and immutability of blockchain technology with business intelligence [12,18]. Blockchain technology makes sure that the origin of data can be traced, that all transactions can be traced, and that changes that occur with time can be traced as well [20,22]. Such transparency removes any gaps or errors that might occur as a result of segregating data. Business intelligence with transparency enables managers or decision-makers to view data related to the flow of data, as well as data provided by the analysis [6,14]. The transparent nature of the information environment facilitates collaboration [7,15]. Thus, blockchain-based business intelligence establishes transparency in credible information processes [20]. The reasoning outlined above has permitted this study to propose the following assumptions:

H2: Blockchain-enabled business intelligence has a positive impact on data transparency.

Data transparency is considered a basic requirement in productive strategic decision-making in today's organizations. If data is transparent, it means that the decision-makers have accurate, complete, and consistent information at their command [10]. This allows organizations to monitor their operations on a constant basis [6]. Organizations will be able to detect opportunities and threats that arise. This is a basic issue in organizations that require proactive strategic action

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[31]. Organizations will be in a position to synchronize their operations with the demands of the environment. This is necessarily a result of data transparency [10,32].

Moreover, data transparency promotes cooperation and communication between units in an organization. These are important elements in forming strategic agility [9]. Sharing one and the same verified information between all stakeholders of an organization leads to increased cooperation and harmonization of strategic moves [13,16]. Data transparency fosters a constant process of organizational learning. This results in agile strategic moves and innovations [19,21]. Therefore, apart from promoting faster decision-making, data transparency leads to higher-quality strategic moves. On this logic, the study assumption is as follows:

H3: Data transparency has a positive influence on strategic agility.

Though blockchain-based business intelligence provides an enhanced level of analytics and predictability, the role of such business intelligence in facilitating strategic agility is dependent upon the interpretation and trust maintained by the organizations in the results obtained through the system [26,32]. Strategic agility in business cannot be achieved through enhanced analytical and predictable solutions if the results are not trusted or if the sources of the data are not transparent to the organization [16,20]. Data transparency covers the factor of trust and enables the results to be traceable and verified.

Moreover, data transparency serves as an essential explanation for the connection between technology adoption and strategic outcomes [11,17]. The adoption of blockchain-based business intelligence improves data transparency through real-time visibility and incorruptible data entries. If data transparency is higher, organizations are more ready to adopt the findings produced by analytical systems, which quickens strategic reactions and flexibility [17,20]. By the same token, low data transparency may reduce the efficacy of analytics, even when the technical systems employed are of a superior level of sophistication [18,21]. Therefore, data transparency is an explanation for and an underlying reason why blockchain-based business intelligence drives strategic agility rather than a direct technical consequence [10,15]. The study assumed the following based on this explanation:

H4: Data transparency positively mediates the relationship between blockchain-enabled business intelligence and strategic agility.

3 Methodology

3.1 Design

This research adopts a quantitative design to examine how blockchain-enabled business intelligence supports strategic agility through improved logistics information flows. The methodology focuses on the flow or management of information, financial flows, and human flows within SMEs, emphasizing how transparent and traceable data flows enable faster sensing, coordination, and strategic decision-making.

This research uses a quantitative research design to explore the strategic agility impact of blockchain-enabled business intelligence, using the mediating variable of data transparency. Quantitative research is appropriate for this study, as it allows the testing of hypotheses in relation to theoretical relationships between constructs, using statistical modeling. The research is cross-sectional, as it involves gathering data at one point to explore the research participants' perceptions of the research constructs within the organizational setting. The research takes place in the SMEs, which are known to have the following characteristics: data-intensive, technologically progressive, and using advanced digital technologies to make strategic decisions. The SME companies are an appropriate setting in which to conduct the research, as it involves the processing of substantial quantities of operating and customer data, and the trend in the industry is toward the use of blockchain and analysis technologies to increase strategic responsiveness and competitiveness.

3.2 Companies and sample

The population of interest in the research included SME firms operating in a competitive and digitally enabled space. Data were collected from 372 respondents who are in management positions within their companies. The candidates/target population have been considered due to the substantial application of BI systems and an increasing fascination with blockchain integration to enhance the clarity and decision-making potential of data in the different firms. The level of analysis in the research included the employees of the organization, specifically in positions concerning management and professionalism associated with IS, strategy, and decision-making. These candidates have been regarded as appropriate owing to their substantive involvement in the application and decision-making of BI systems within the organization of employment. Any form of purposive sampling is used to guarantee that the candidates have adequate experience and knowledge regarding the research constructs.

3.3 Pilot study

Before the initiation of the primary gathering of data, a pilot test is used to test the clarity, reliability, and validity of the measurement tool to be used within the study. In this case, the study carefully selected 28 respondents from the targeted population for the main study to participate in the pilot test. The study intentionally excluded these respondents

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from the final analysis to prevent bias in it. The primary objective of conducting a pilot test is to examine the wording of the items used in a questionnaire, point out any inconsistencies, and ensure a consistent understanding of the questions being asked in a given questionnaire by its respondents. In addition, reliability will be measured to ensure that all variables have an acceptable internal consistency before embarking on gathering data in relation to a study.

3.4 Measurement and data collection

The use of a structured questionnaire made it possible to conduct the measurement of the constructs related to the study in a manner fitting the research setting and purpose. All the measurement statements were posed using a five-point Likert scale ranging from "strongly disagree" to "strongly agree." The use of a Likert scale has been generally well accepted and adopted in various studies for the proper determination of the perceptual and behavioral elements. The measurement statements were adopted from other concrete and contemporary studies on related fields such as blockchain technology, business intelligence, data transparency, and strategic agility. The statements were specifically adapted to fit the organizational setting of the current research. Business intelligence achieved using blockchain technology was measured using a set of statements related to the integrity of the data, use of unalterable data sources, ability of results derived using analytical systems, and tracing the use of the data for analytical functions [1,4,6]. Data transparency was measured using the set of statements adopted to determine the traceability of the data sources, understanding of access to the organizational data, and consistency of the organizational information [23,24]. Strategic agility was measured using a set of statements adopted to determine the organizational responses to the various changes and adjustments, rapid decision-making on the organizational strategic plans, efficient reorganization of organizational resources, and adjustment of organizational strategies in accordance with the various market adjustments [9,10,13]. The measurement model has been instrumental in establishing both the internal consistency and the validity of the measures, establishing the suitability and accuracy of the current study on the desired aspects, and fitting this organizational setting.

Data acquisition and collection are carried out using a self-report survey questionnaire administered through an online platform to the participants in the SMEs' corporations. The online survey format allows for flexibility, especially when dealing with geographically dispersed participants for efficient responses. The survey administration is carried out voluntarily, and the participants are informed of the relevance of the research while assured that their confidentiality and anonymity are maintained. Prior consent from identifiable persons in organizational settings that require such consent prior to administration is sought by researchers. Follow-up notifications are also conducted to ensure effectiveness when responding to the survey questionnaires. The entire data collection process is conducted within a set time frame that gives adequate time for response without allowing time bias.

3.5 Analytical methodologies

Analysis of data was done using structural equation modeling with a focus on partial least squares structural equation modeling (PLS-SEM). Analysis using the PLS-SEM technique was essentially informed by the following characteristics surrounding the PLS-SEM method: There was a two-step procedure carried out in the analysis of the data. Firstly, it involves evaluating the measurement model to test the reliability and validity of constructs identified in the research design ex-post. Apart from examining internal-consistency reliability, discriminant validity, and convergent validity, it is followed by analyzing the structural model to test the validity of hypothesized relations between constructs identified in the research design ex-post. Afterward, the results of the structural model are analyzed to test the hypotheses and verify the validity of the relationships among the constructs identified in the ex-post research design. A mediating role of transparency in collected data is tested through analyzing direct and indirect relations between blockchain-based business intelligence and strategic agility in an organization. Bootstrapping techniques are utilized to determine significance in mediating roles identified in research ex post. This step renders empirical evidence in supporting or opposing identified hypotheses in research design and explaining relations between variables under study in ex-post research design [25].

4 Results and discussion**4.1 Sample characteristics**

The following is a description of the demographic characteristics of the participants shown in Table 1. The research participants consist mostly of male respondents, reflecting their dominant role in data-intensive industries. Most respondents choose the option that categorizes them between the ages of 35 and 44 years, which represents over a decade of work experience, ensuring that the respondents mostly consist of experts and persons with experience. Most research participants take senior managerial positions, which provides reliable results, given that they closely take part in organizational decisions concerning blockchain-enabled business intelligence.

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Table 1 Demographic characteristics of the sample

Category	Frequency	Percentage (%)
Gender (Male)	241	64.8
Gender (Female)	131	35.2
Age (25-34 years)	98	26.3
Age (35-44 years)	164	44.1
Age (45 years and above)	110	29.6
Managerial Level (Middle)	156	41.9
Managerial Level (Senior)	216	58.1
Experience (5-10 years)	143	38.4
Experience (More than 10 years)	229	61.6

4.2 Descriptive statistics

The values contained within Table 2 illustrate the data descriptions of the variables studied. The mean score of each variable exceeds 4.00, recommending a general consistency among the study participants regarding the importance and adoption rate of blockchain-based business intelligence, data transparency, and strategic agility within their respective companies. Additionally, the relatively low values of the standard deviations indicate a degree of homogeneity among the study respondents' perceptions, hence enhancing the reliability of the collected data [25].

Table 2 Descriptive statistics of study variables

Construct	Mean	Standard Deviation
Blockchain-Enabled Business Intelligence (BEBI)	4.15	0.61
Data Transparency (DT)	4.08	0.66
Strategic Agility (SA)	4.21	0.58

4.3 Measurement model assessment

Results of reliability and convergent validity for the measurement model are put forth in Table 3. Alpha values are found to be between 0.88 and 0.91, and composite reliability values are found to be higher than 0.92 for all variables, thus establishing high reliability of the internal consistency of the scale. All indicator loadings are well above the proposed cut-off, thus establishing the reliability of the indicators and corroborating convergent validity. In addition to this, AVE values are well above the cut-off value of 0.50, hence establishing high convergent validity. Therefore, results have confirmed and established the reliability of the proposed measurement model and its appropriateness for further structural analysis using SmartPLS 4 [25].

Table 3 Reliability and validity analysis of constructs

Construct	Code	Measurement Item	Loading	Alpha	CR	AVE
Blockchain-Enabled Business Intelligence (BEBI)	BEBI1	Data integrity is ensured through Blockchain.	0.85	0.90	0.93	0.72
	BEBI2	Analytics relies on immutable data sources.	0.87			
	BEBI3	BI outputs are highly reliable.	0.84			
	BEBI4	Data traceability supports analytics.	0.86			
Data Transparency (DT)	DT1	Data sources are fully traceable.	0.83	0.88	0.92	0.70
	DT2	Data access is clear and verifiable.	0.85			
	DT3	Information is consistent across systems.	0.84			
Strategic Agility (SA)	SA1	The firm responds quickly to change.	0.86	0.91	0.94	0.75
	SA2	Strategic decisions are made rapidly.	0.88			
	SA3	Resources are reconfigured efficiently.	0.87			
	SA4	Strategy adapts proactively to markets.	0.85			

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The discriminant validity test is conducted as illustrated in Table 4. The square root of the average variance extracted (AVE) of each construct is greater than the correlation between constructs. This confirms that blockchain-enabled business intelligence, data transparency, and strategic agility are separate constructs, thus satisfying the conditions of discriminant validity [25].

Table 4 Discriminant validity (Fornell–Larcker criterion)

Construct	BEBI	DT	SA
Blockchain-Enabled Business Intelligence (BEBI)	0.85		
Data Transparency (DT)	0.63	0.84	
Strategic Agility (SA)	0.59	0.67	0.87

4.4 Structural model results

Table 5, results from the direct path test reveal that all proposed paths are positive and significant. The connection between blockchain-enabled business intelligence and strategic agility has been identified to produce a positive impact ($\beta = 0.34$, $p < 0.001$), thus indicating that greater levels of blockchain-enabled business intelligence lead to enhanced levels of strategic agility. In addition, blockchain-enabled business intelligence has been identified to create a strong positive impact on the variable of data transparency ($\beta = 0.57$, $p < 0.001$), thus highlighting its critical role in making the data more visible, authentic, and credible. Furthermore, the variable of data transparency has been identified to produce a strong positive impact on strategic agility ($\beta = 0.41$, $p < 0.001$), thus highlighting that the more transparent the data environments, the more flexible the organization [25].

Table 5 Path analysis results for direct hypotheses testing

Hypothesis	Path	β	t-value	p-value	Result
H1	BEBI $\rightarrow$ SA	0.34	6.21	<0.001	Supported
H2	BEBI $\rightarrow$ DT	0.57	10.04	<0.001	Supported
H3	DT $\rightarrow$ SA	0.41	7.58	<0.001	Supported

4.5 Mediation analysis

As evident from Table 6, the result for the mediation test reveals that there is a positive indirect effect of blockchain business intelligence on strategic agility that is partially mediated by data transparency ($\beta = 0.23$, $p < 0.001$). The findings reflect that there is a direct effect, indicating that data transparency partially mediates this relationship. Data transparency is a crucial factor in determining how blockchain business intelligence affects strategic agility [25].

Table 6 Mediation analysis results

Path	Indirect Effect (β)	t-value	p-value	Mediation Type
BEBI $\rightarrow$ DT $\rightarrow$ SA	0.23	6.02	<0.001	Partial Mediation

4.6 Model fit assessment

The fit statistics shown in Table 7 reveal a satisfactory fit model. The SRMR value (0.064) is well below the cut-off, thus validating a satisfactory fit model. The value of NFI (0.92) is above the minimum acceptable fit level; thus, a high level of comparative fit is achieved. Further, the chi-squared to degree of freedom (2.41) is below the acceptable level; thus, a satisfactory fit model is achieved [25].

Table 7 Model Fit indices

Index	Value	Threshold
SRMR	0.064	< 0.08
NFI	0.92	> 0.90
Chi-square/df	2.41	< 3.00

4.7 Discussion

From a logistics perspective, the findings emphasize that transparent information flows reduce uncertainty and support faster coordination of decisions across operational processes. The results show that blockchain-based business intelligence supports strategic agility in a positive way by improving the validity, credibility, and availability of data within an organization [26,27]. In its role of making data immutable and traceable, blockchain enhances the basis of strategic decision-making by allowing an organization to detect changes within its environment [8,12]. This finding largely

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supports modern theoretical assumptions suggesting that credible data plays a significant role in allowing an organization to achieve strategic agility [28,23]. Nonetheless, modern theoretical studies suggest otherwise because, in its current form, using blockchain-based BI does not necessarily result in an agile organization because of integration issues within a system based on scalability and strategic processes [13].

The findings also show that transparency of the data has a significant function in promoting flexibility in the area of strategy. The use of blockchain in transparency allows the decision-maker access to accurate and traceable data in a short time; therefore, flexibility and adaptability of the strategy are promoted [29,30]. However, recent research argues that too much flexibility might bring benefits together with some negative consequences [20]. For example, there might be an “information overload” problem. Moreover, flexibility might make the organization more exposed to “data risks of privacy” since the flow of the data is highly transparent [10,18].

Results also indicate that data transparency is an important mediator between blockchain-enabled business intelligence and strategic agility. This implies that the strategic worth of blockchain-enabled business intelligence is achieved not only by leveraging analytics but also by making such analytics readily accessible throughout the organization due to data transparency [27,31]. This is even as recent empirical work establishes that data transparency remains critical in achieving strategic agility, as supported by recent empirical work; however, there are challenges in maintaining such an environment in relation to blockchain technology strategic agility [16,22]. These include issues surrounding regulations and compatibility, as well as validating data.

Concluding, it is evident that the application of blockchain-based business intelligence is able to provide strategic agility in an organization primarily because of improved transparency in data [10,16]. Nonetheless, recent studies have indicated that strategic agility is significantly dependent on the organizational acumen of the firm in relation to its digitization and analytics acumen [2,23]. Should the alignment between these elements be flawed, likely, the potential of blockchain-based BI in creating strategic agility will not be fully actualized [21,32].

5 Conclusion and future research

In practical terms, SMEs can improve the flow or management of information and financial flows by adopting BEBI to increase traceability, visibility, and decision speed. This research question focused on examining how blockchain business intelligence impacts a firm’s strategic agility, particularly regarding data transparency in a Jordanian SME environment. The findings suggest a significant positive impact of business intelligence, coupled with blockchain technology, on a firm’s strategic agility, as this amalgamation of technologies boosts the reliability, accuracy, and authenticity of data, allowing a firm to notice and respond to turbulence within a short timeframe. The role of data transparency plays an essential part and makes a significant positive contribution to the positive impact of blockchain business intelligence, enabling a firm to adapt to a rapidly changing environment with its pliable processes of decision-making.

The findings of this study may contribute to the development of the theory of business intelligence and strategic agility by demonstrating how blockchain technology can enhance data clarity and its effect on strategic agility capabilities [23]. Furthermore, the findings of this study have managed to verify the significance of data clarity in playing the role of a mediator, hence explaining and refining contemporary theories associated with the adoption of technology and strategic agility in having a direct and clear relationship, with less weightage to the significance of ensuring clarity and cleanliness of data streams [21,32]. From a practical standpoint, this particular research work appears to be a reliable source of information for managers who are eager to use blockchain-based management intelligence to enhance managerial agility [17,27]. The implication of the conclusion derived from this research work indicates the need to wire in proper data governance systems and invest in blockchain technologies to enjoy better performance gains in business [28]. There is a need for focus on how to ensure the involvement of innovative strategies and to inculcate transparency in their business strategies to ensure adaptability in business for the benefit of various professionals working in the realm of business innovation strategies [29].

However, the contribution notwithstanding, there exist limitations that the study faces as well. Firstly, the cross-sectional study design that the research uses restricts the study from demonstrating the dynamics and causality existing between the perceptions. This study uses perceptual variables that can be prone to respondent bias. Furthermore, the results derived from this research might be context-dependent and could be affected by organizational configurations, industry standards, and technology implementations; therefore, generalization of these results in finding the significance of blockchain-supported BI might be a challenge. Other research can be conducted to address the above-mentioned constraints by implementing longitudinal research where the impact of blockchain-supported BI and data transparency on SR might be explored. Furthermore, future research work can incorporate more mediating variables like the culture of the organization, the evolution of the digital world, and so on. In addition, it can concentrate on varying industries. This will incorporate more authenticity into the findings of the research work. This will show a deeper understanding of the strategic implications of the use of blockchain while referring to the field of business intelligence.

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