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Unlocking Blockchain Adoption in Healthcare: Transparency, Knowledge Application, and Behavioural Intention

Abdulkareem H. Dbesan[1] **Saad G. Yaseen**[2]

[1] *Nineveh Health Directorate, Al-Baaj, Iraq.*

[2] *Al-Zaytoonah University of Jordan, Amman, Jordan.*

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Abstract

Blockchain technology has emerged as a transformative digital innovation with considerable potential to enhance transparency, data integrity, and trust across healthcare systems. Despite its recognised benefits, the mechanisms through which blockchain transparency influences healthcare professionals' willingness to adopt the technology remain insufficiently understood. This study examines the effect of blockchain transparency on physicians' behavioural intention to adopt blockchain technology while investigating the mediating role of knowledge application. A quantitative cross-sectional survey was conducted among physicians working in nine public hospitals in Mosul City, Iraq. Data were collected from 322 valid respondents using a structured questionnaire and analysed using SmartPLS and SPSS. The findings reveal that blockchain transparency has a positive and significant direct effect on both knowledge application and physicians' behavioural intention to adopt blockchain technology. Knowledge application also exerts a significant positive influence on behavioural intention and partially mediates the relationship between blockchain transparency and blockchain adoption intention. These findings demonstrate that transparent, traceable, and tamper-resistant healthcare information enhances physicians' ability to apply medical knowledge effectively, thereby increasing their confidence in blockchain technology and strengthening their intention to adopt it. The study contributes to the literature by extending current understanding of blockchain adoption through the integration of knowledge management and technology adoption perspectives and by identifying knowledge application as a key explanatory mechanism linking blockchain transparency to behavioural intention. The findings also provide practical guidance for healthcare policymakers and hospital administrators seeking to implement blockchain-based systems.

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1. Introduction

The accelerating growth of digital technologies has fundamentally transformed the way organisations create, manage, and exploit knowledge. In knowledge-intensive environments, competitive advantage is no longer derived solely from tangible resources but increasingly depends on the efficient generation, sharing, protection, and application of organisational knowledge (Bergh et al., 2024). However, as organisational knowledge becomes more voluminous, heterogeneous, and geographically distributed, traditional knowledge management (KM) systems have become progressively inadequate for ensuring transparency, trust, security, and rapid accessibility (Sun et al., 2022). Consequently, organisations are actively exploring emerging digital technologies capable of overcoming these limitations while simultaneously supporting sustainable organisational performance.

Among the emerging digital technologies, blockchain has attracted considerable scholarly and practical attention because of its decentralised architecture, immutability, transparency, and cryptographic security. Since its introduction by (Nakamoto, 2008) as the technological foundation of Bitcoin, blockchain has evolved far beyond cryptocurrencies into a disruptive technology with applications across numerous sectors, including healthcare, finance, supply chains, public administration, and knowledge management (Akbar et al., 2026). Unlike conventional centralised databases, blockchain stores information across distributed networks, thereby eliminating dependence on a central authority while ensuring data integrity, traceability, and tamper resistance.

Healthcare represents one of the sectors expected to benefit substantially from blockchain adoption. The COVID-19 pandemic further highlighted the urgent need for secure digital infrastructures capable of supporting patient-centred healthcare, facilitating data sharing, improving service quality, and strengthening organisational resilience (Haleem et al., 2021). Accordingly, blockchain has been increasingly recognised as an enabling technology for electronic health records, disease surveillance, pharmaceutical traceability, medical device monitoring, and secure information exchange among healthcare stakeholders (Jafri & Singh, 2022).

Beyond healthcare operations, blockchain offers significant opportunities for enhancing knowledge management processes. The decentralised nature of blockchain provides organisations with secure mechanisms for knowledge storage, transparent knowledge sharing, intellectual property protection, and trustworthy knowledge application (Akhavan et al., 2018). Unlike traditional KM systems that rely on central repositories vulnerable to cyberattacks and unauthorised access, blockchain enables distributed knowledge repositories that preserve data integrity while facilitating authorised access across organisational boundaries (Nyame et al., 2020). Furthermore, blockchain-supported smart contracts automate knowledge-sharing processes, improve accountability, and address

persistent concerns regarding ownership, privacy, and copyright protection associated with organisational knowledge (Yang et al., 2021).

Consequently, blockchain is increasingly viewed not merely as an information technology innovation but as a strategic enabler of organisational knowledge management capable of accelerating knowledge application, promoting collaboration, enhancing organisational transparency, and stimulating innovation (Escorcia Guzman et al., 2022).

Despite its considerable potential, blockchain adoption remains relatively limited worldwide. Although governments and research institutions continue investing heavily in blockchain development, organisations remain hesitant to implement the technology because of concerns regarding privacy, scalability, interoperability, implementation costs, regulatory uncertainty, and shortages of specialised expertise (Mamun, 2022; McGhin et al., 2019). These challenges are particularly pronounced in developing countries, where technological infrastructure, organisational readiness, and institutional support remain relatively underdeveloped.

Within the Iraqi healthcare sector, blockchain implementation remains at an early stage despite increasing recognition of its potential to improve healthcare quality, knowledge management, and organisational performance. Existing healthcare organisations continue to rely primarily on traditional information systems that limit efficient knowledge sharing, reduce transparency, and constrain collaborative decision-making. Consequently, understanding the organisational factors influencing blockchain adoption has become an important research priority for healthcare managers, policymakers, and technology developers.

Although blockchain adoption has attracted growing academic interest, several important knowledge gaps remain. First, previous studies have predominantly focused on technological characteristics, security issues, and adoption intentions while paying comparatively limited attention to blockchain's strategic role in supporting knowledge management processes. Second, although knowledge application represents the ultimate objective of knowledge management, relatively few studies have examined how blockchain capabilities facilitate the practical utilisation of organisational knowledge rather than merely its storage or transfer. Third, empirical evidence regarding blockchain adoption within healthcare organisations in developing economies remains scarce, particularly in the Middle Eastern context. Finally, few studies have integrated blockchain technology with knowledge application within a comprehensive theoretical framework capable of explaining users' behavioural intentions in public healthcare institutions.

These limitations suggest the need for research that extends blockchain adoption literature beyond technological acceptance by examining its relationship with organisational knowledge management. Such an approach contributes not only to understanding why individuals adopt

blockchain technology but also how this technology can generate organisational value through improved knowledge application.

To address these research gaps, the present study investigates the determinants influencing users' behavioural intention to adopt blockchain technology within Iraqi public hospitals while examining blockchain as an enabler of knowledge application. The study seeks to identify the technological and organisational factors that encourage blockchain acceptance and to demonstrate how blockchain can strengthen knowledge application through secure, transparent, and decentralised information exchange.

The study contributes to the literature in four important ways. First, it extends blockchain adoption research by integrating blockchain technology with knowledge management, thereby bridging two research streams that have largely evolved independently. Second, it enriches understanding of blockchain's strategic value by positioning knowledge application as a central organisational outcome rather than focusing exclusively on technological adoption. Third, it provides empirical evidence from the Iraqi healthcare sector, a context that remains substantially underrepresented in existing blockchain research. Finally, the findings provide practical guidance for healthcare organisations, policymakers, and digital transformation initiatives seeking to implement blockchain-based knowledge management systems capable of enhancing transparency, collaboration, and healthcare service quality.

The remainder of this paper is organised as follows. Sections 2 and 3 review the relevant literature and develop the theoretical framework and research hypotheses. Section 4 presents the research methodology. Section 5 reports the empirical findings. Section 6 discusses the results in relation to existing theory and previous studies. Finally, Section 7 present the study's conclusions, theoretical and practical implications, limitations, and directions for future research.

2. Literature Review

2.1 Blockchain Technology

Blockchain technology was first introduced by Nakamoto in 2008 as a solution to the double-spending problem through a peer-to-peer (P2P) network (Nakamoto, 2008). This technology enables direct interaction between two parties without requiring a trusted third party (Paul et al., 2022). The fundamental building blocks of blockchain are blocks, each containing time-stamped transactions that record the exact date and time of their creation (Marletta et al., 2025). These blocks are sequentially linked using a predefined cryptographic algorithm to form a blockchain, with new blocks being validated and added by miners through a consensus mechanism (Kumar & Goyal, 2024).

Blockchain technology is generally classified into three main types: public, private, and hybrid blockchains. Public blockchains are open networks that allow unrestricted participation, enabling any user to join the network, perform transactions, and participate in the mining process in a fully transparent and decentralised environment. In this type of blockchain, every participating node maintains a synchronised copy of the entire distributed ledger, and it is therefore commonly referred to as a permissionless blockchain (Mallick et al., 2025). In contrast, private blockchains are distributed databases that can only be accessed by authorised individuals who have been granted specific permissions or privileges. Their primary objective is to facilitate secure data sharing and information exchange either within a single organisation or among multiple collaborating organisations (Oh, 2025). Hybrid blockchains combine the characteristics of both public and private blockchain architectures by allowing organisations to determine which data remain publicly accessible and which require authorised access. This is achieved through the integration of permissioned and permissionless systems within the same blockchain infrastructure (Haleem et al., 2021). Consequently, hybrid blockchains may be regarded as semi-private systems that operate across multiple organisations. While write permissions are restricted to predefined authorised entities responsible for maintaining the distributed ledger, read permissions are typically available to all users connected to the network (Han et al., 2022).

From a healthcare perspective, blockchain technology has become increasingly important for several reasons. First, it enables healthcare providers to exchange medical information rapidly, accurately, and securely, thereby improving the quality and continuity of patient care (Shaikh et al., 2025). Furthermore, healthcare professionals can securely access patients' complete medical histories to support more informed clinical decision-making. Beyond clinical practice, the knowledge stored within blockchain-enabled medical knowledge bases can be analysed to identify emerging trends and patterns in diseases, treatments, and patient outcomes, thereby facilitating medical research and accelerating the development of innovative therapeutic interventions and pharmaceutical products (Dewangan & Chandrakar, 2025).

2.2 Transparency in Blockchain Technology

Transparency refers to the broad availability of information and knowledge, thereby reducing information asymmetry and enabling transactions to be verified efficiently and reliably (Falwadiya & Dhingra, 2022). Blockchain technology inherently provides a high degree of transparency through the integration of sophisticated cryptographic algorithms and distributed database architectures, which securely link each newly generated block to its predecessor, creating an immutable chain of blocks (Hasselgren et al., 2020). Every transaction is recorded within a block, validated by network nodes through a consensus process, and permanently stored on the distributed ledger. As a result, blockchain

enables authorised users—and, in the case of public blockchains, the wider public—to access and verify all recorded transactions, thereby significantly enhancing transparency, traceability, and accessibility (Kukman & Gričar, 2025).

From an organisational perspective, successful technological transformation depends largely on an organisation's ability to provide transparent knowledge that can be accessed and utilised by stakeholders to strengthen both internal and external knowledge resources as well as collaborative social networks (Grigoriou & Rothaermel, 2016). Accordingly, the distributed architecture of blockchain technology enables participants to view, share, and access knowledge and transaction records through a transparent and secure environment, thereby facilitating knowledge exchange and improving the accessibility of organisational information (Falwadiya & Dhingra, 2022).

2.3 Knowledge Application

The primary objective of knowledge management is to ensure that knowledge can be effectively retrieved and applied whenever required. Accordingly, it is essential for individuals to have timely access to accurate information and relevant knowledge to accomplish specific tasks and make informed decisions (Storey, 2025). Knowledge application refers to the process through which individuals and organisations utilise available knowledge in their operational activities. The outcomes of effective knowledge application are reflected in the development and innovation of products and services, improved organisational performance, and reduced production costs. Moreover, leveraging existing knowledge generated by others is particularly valuable, as it saves the time, effort, and financial resources that would otherwise be required to generate new knowledge (Khoa & Hoa, 2021). According to (Kumar, 2021), knowledge application is the process of using available knowledge to perform organisational tasks and support critical decision-making. Knowledge itself possesses little value unless it is effectively utilised; consequently, without the practical application of knowledge, the knowledge management process remains incomplete.

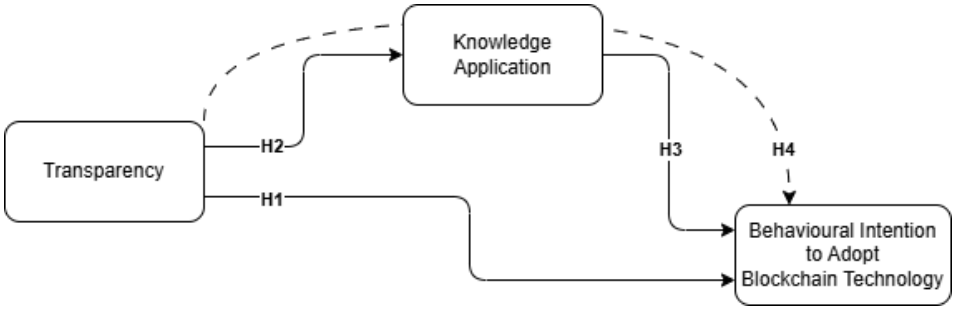
From an organisational perspective, knowledge application enables organisations to realise the full benefits of integrating knowledge acquired from both internal and external sources in pursuit of organisational objectives. When organisations effectively apply relevant knowledge, they reduce the likelihood of errors, minimise unnecessary duplication, enhance operational efficiency, and continuously leverage their accumulated organisational expertise to achieve sustainable competitive advantage (Lenart-Gansiniec, 2022). One of the most widely adopted approaches to knowledge application involves identifying and implementing best practices developed by leading organisations. Given the largely tacit nature of organisational knowledge, its true value lies in its effective application. Through the successful application of knowledge, organisations can accelerate the development of

new products and services while simultaneously improving their managerial and technological systems. Empirical evidence consistently demonstrates that organisations capable of applying knowledge effectively are more likely to achieve and sustain competitive advantage (Ode & Ayavoo, 2020).

3. Conceptual Model and Hypothesis Development

The conceptual model proposed in this study examines the effect of blockchain transparency on physicians' behavioural intention to adopt blockchain technology, while considering the mediating role of knowledge application. The proposed research model is illustrated in Figure 1.

Figure 1. The conceptual model of study



Source: *Authors' own work*

3.1 Transparency and Behavioural Intention to Adopt Blockchain Technology

Transparency constitutes a fundamental prerequisite for building trust in emerging technologies, as it reduces the uncertainty associated with technological systems, particularly within complex organisational environments such as healthcare. Recent studies have demonstrated that transparency in information exchange within digital healthcare systems enhances institutional trust and increases users' intentions to adopt new technologies (Esmaeilzadeh & Mirzaei, 2019). In this context, blockchain-based systems provide an immutable and traceable ledger that improves the visibility of healthcare processes while reducing the risks of ambiguity, data manipulation, and fraud (Saeed et al., 2022). Furthermore, previous research has shown that users' perceptions of information transparency in digital healthcare systems are positively associated with cognitive trust, which, in turn, represents a direct determinant of behavioural intention to use these technologies (Bazel et al., 2025). In addition, the literature suggests that transparency functions not merely as a technical characteristic but also as a cognitive mechanism that facilitates technology acceptance by enhancing perceived usefulness while simultaneously reducing perceived risk (Balasubramanian et al., 2021). Consequently, the

implementation of blockchain technology in healthcare, through its ability to provide transparent data exchange and secure patient records, is expected to directly strengthen both organisational and individual intentions to adopt this technology. Based on the foregoing discussion, the following hypothesis is proposed:

H1: Blockchain transparency has a positive and significant effect on physicians' behavioural intention to adopt blockchain technology.

3.2 The Mediating Role of Knowledge Application

Within organisations, centralised organisational structures often impede the rapid transfer and sharing of knowledge among organisational members, thereby limiting the effective application of organisational knowledge (García-Holgado et al., 2015). Blockchain technology, when integrated with knowledge management practices, offers a promising solution to these challenges through its distributed database architecture, which enables participants to access, share, and verify knowledge and transaction records in a transparent, decentralised, and readily accessible environment (Falwadiya & Dhingra, 2022). When users perceive that blockchain technology enables timely and transparent access to organisational knowledge, best practices, and accumulated experience, they are better able to transform explicit knowledge stored within organisational repositories into tacit knowledge that can subsequently be applied in practice. This enhanced capability is expected to strengthen users' behavioural intention to adopt blockchain technology.

Moreover, numerous studies have suggested that organisations exhibiting greater readiness to implement information systems are also those that continuously improve their organisational knowledge application capabilities (Gold et al., 2015; Grego et al., 2024). This perspective is consistent with the view that knowledge application serves as an important enabler of successful technological innovation. In the context of blockchain technology, the inherent characteristics of decentralisation, immutability, security, and traceability enable physicians across different healthcare organisations to communicate and exchange information directly without relying on centralised administrative authorities, thereby promoting collaboration and facilitating the effective application of knowledge (Li & Liang, 2022). Consequently, when users perceive that blockchain technology enables them to apply existing knowledge more effectively in new situations and supports informed decision-making to address workplace challenges, they are more likely to regard the technology as both useful and easy to use, thereby increasing their behavioural intention to adopt it. Accordingly, the following hypotheses are proposed:

H2: Blockchain transparency has a positive and significant effect on physicians' knowledge application in hospitals.

H3: Knowledge application has a positive and significant effect on physicians' behavioural intention to adopt blockchain technology.
H4: Knowledge application positively mediates the relationship between blockchain transparency and physicians' behavioural intention to adopt blockchain technology.

4. Methodology

4.1 Measurement Instrument Development

A questionnaire survey was conducted among physicians working in public hospitals in Mosul City to evaluate the proposed conceptual framework of the present study. Specifically, the study examined the relationships between blockchain transparency, knowledge application, and physicians' behavioural intention to adopt blockchain technology in healthcare settings. To measure the study constructs, twelve measurement indicators were adapted from established scales reported in previous studies (Al Yami et al., 2021; Dbesan et al., 2023; Devi Ramachandran et al., 2009). The questionnaire items were subsequently reviewed and validated by a panel of academic experts to ensure their content validity and contextual appropriateness.

Data were collected using a cross-sectional survey design, with all measurement items assessed on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Of the 330 questionnaires distributed, 322 valid responses were returned and deemed suitable for statistical analysis, representing a response rate of approximately 97.6%. The collected data were analysed using SmartPLS and SPSS software packages. The questionnaire comprised four sections: (a) respondents' demographic characteristics, (b) the independent variable—blockchain transparency, (c) the mediating variable—knowledge application, and (d) the dependent variable—behavioural intention to adopt blockchain technology – see Appendix A.

4.2 Population and Sample

To test the proposed hypotheses, this study adopted a quantitative research approach using a structured questionnaire specifically designed to examine the effects of blockchain transparency and knowledge application on physicians' behavioural intention to adopt blockchain technology in public hospitals in Mosul City.

The study was conducted within the Nineveh Health Directorate, one of the largest and most important healthcare authorities in northern Iraq, which supervises several public hospitals. Data were collected from physicians employed in nine major public hospitals to investigate the extent to which blockchain transparency and knowledge application influence their intention to adopt blockchain technology in healthcare practice.

A convenience sampling technique was employed to collect the survey data. The target population consisted of 1,636 physicians working across the participating hospitals. Based on Stephen Thompson's sample size formula, the minimum required sample size was calculated to be 312 respondents. The final dataset comprised 322 valid responses, thereby exceeding the minimum sample size requirement and ensuring adequate statistical power for hypothesis testing. The demographic profile of the respondents is presented in Table 1.

Table 1. Respondents' demographics

Categories	***Details***	***#***	***%***
Gender	*Male*	188	58.39
	Female	134	41.61
Education	*PhD*	91	28.26
	MSc	34	10.56
	BSc	197	61.18
Age (#years)	*Less than 31*	158	49.07
	31 - 40	70	21.74
	41 - 50	45	13.98
	51 - 60	25	7.76
	More than 60	24	7.45
Job Experience (#years)	*Less than 6*	158	49.07
	6 – 10	70	21.74
	11 – 15	45	13.98
	16 – 20	25	7.76
	More than 20	24	7.45

Notes: *N=322*
Source: *Authors' own work*

5. Results

5.1 Measurement Model Assessment

The measurement model was assessed using SmartPLS to evaluate both convergent validity and discriminant validity, as described below.

Convergent validity was evaluated using four commonly accepted indicators: composite reliability (CR), individual item loadings, average variance extracted (AVE), and Cronbach's alpha (α). According to (Jr et al., 2017), item loadings and composite reliability values should exceed 0.70, while the AVE should be greater than 0.50, and Cronbach's alpha should also be above 0.70.

The present study examined three latent constructs: blockchain transparency, knowledge application, and behavioural intention to adopt blockchain technology. The convergent validity results presented in Table 2 indicate that all item loadings and composite reliability values exceeded the recommended threshold of 0.70. Likewise, all AVE values were greater than 0.50, confirming adequate convergent validity. Furthermore, Cronbach's alpha coefficients for all constructs exceeded

the recommended minimum value of 0.70, indicating satisfactory internal consistency reliability. Collectively, these findings demonstrate that the measurement model exhibits adequate convergent validity, confirming that the indicators associated with each construct measure the same underlying concept. Consequently, all measurement items were retained, and no indicators required removal from the model.

Table 2. Convergence validity results

Constructs	Loading Factors	Cronbach's Alpha (α)	Composite Reliability (CR)	Average Variance Extracted (AVE)
Transparency	0.787-0.821	0.830	0.885	0.659
Knowledge Application	0.873-0.863	0.832	0.888	0.665
Behavioural Intention	0.807-0.854	0.847	0.897	0.686

Source: *Authors' own work*

Discriminant validity refers to the extent to which each construct in the proposed model is empirically distinct from the other constructs included in the study (Rönkkö & Cho, 2020). In line with recommended practices for PLS-SEM, discriminant validity was assessed using three complementary approaches: cross-loadings, the Fornell–Larcker criterion, and the heterotrait–monotrait ratio (HTMT) (Henseler et al., 2014).

The cross-loading criterion requires each measurement item to load more strongly on its assigned construct than on any other construct in the model. The Fornell–Larcker criterion evaluates discriminant validity by comparing the square root of each construct's AVE with its correlations with the remaining constructs. Discriminant validity is established when the square root of the AVE exceeds all corresponding inter-construct correlation coefficients (Fornell & Larcker, 1981). In addition, the HTMT values should remain below the recommended threshold of 0.85 (Henseler et al., 2014).

The results presented in Tables 2–4 demonstrate that all measurement items loaded more strongly on their respective constructs than on any other construct, thereby satisfying the cross-loading criterion. Moreover, all HTMT values were below the threshold of 0.85, while the square roots of the AVE values exceeded the inter-construct correlations, satisfying the Fornell–Larcker criterion. These findings confirm that the measurement model possesses adequate discriminant validity and indicate that there are no concerns regarding construct overlap or multicollinearity among the study variables.

5.2 Structural Model Assessment

Following the validation of the measurement model, the structural model was evaluated to determine whether the proposed hypotheses were supported by the empirical data. In PLS-SEM, the structural model can be assessed using several evaluation criteria, including the path coefficient (β), t-

value, p-value, coefficient of determination (R^2), effect size (f^2), and predictive relevance (Q^2) (Dbesan et al., 2023). In addition, model fit was assessed using the Standardised Root Mean Square Residual (SRMR) and the Normed Fit Index (NFI). According to (Hu & Bentler, 1999), an SRMR value below 0.08 indicates an acceptable model fit. Likewise, the NFI ranges between 0 and 1, with values closer to 1 indicating a better model fit (Bentler & Bonett, 1980).

Table 3. Fornell-Larcker criterion

Constructs	Behavioural Intention	Transparency	Knowledge application
Behavioural Intention	**0.828**		
Transparency	0.494	**0.812**	
Knowledge application	0.592	0.547	**0.816**

Source: *Authors' own work*

Table 4. Heterotrait-monotrait ratio of correlations (HTMT) criterion

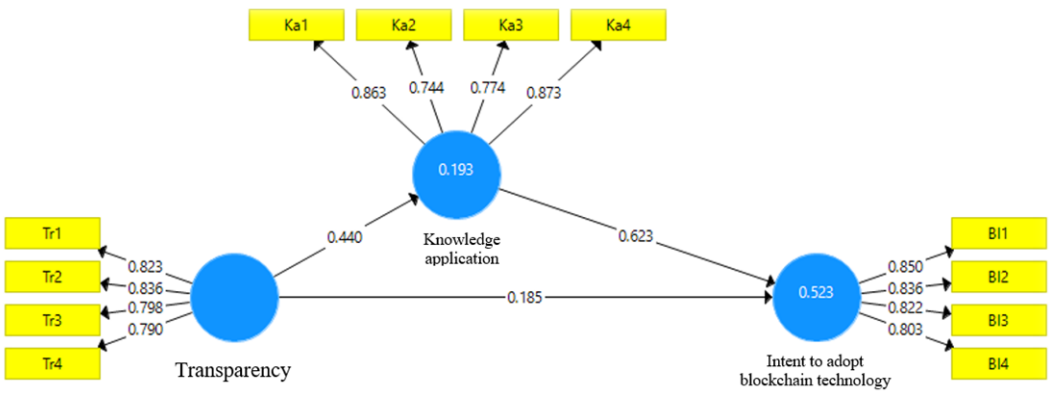
Constructs	Behavioural Intention	Transparency	Knowledge application
Behavioural Intention			
Transparency	0.541		
Knowledge application	0.689	0.633	

Source: *Authors' own work*

The coefficient of determination (R^2) should exceed 0.10 to indicate that the model adequately explains the variance in the endogenous constructs (Falk & Miller, 1992). The effect size (f^2) measures the contribution of each exogenous construct to explaining the variance of the endogenous construct. According to established guidelines, an f^2 value greater than 0.02 indicates a meaningful effect, whereas values exceeding 0.35 represent a large effect size. Predictive relevance (Q^2) evaluates the predictive capability of the proposed structural model, with values greater than zero indicating satisfactory predictive relevance. The proposed model included four main hypotheses, which were tested using SmartPLS. The results of the structural model assessment and hypothesis testing are presented in Figure 2 and Table 5.

The findings reveal that blockchain transparency has a positive and significant direct effect on physicians' behavioural intention to adopt blockchain technology ($\beta = 0.185$, $t = 4.663$, $p < 0.001$). This finding supports H1 and is consistent with the results reported by (Hoxha & Sadiku, 2019; Tran & Nguyen, 2021). Furthermore, blockchain transparency exerts a positive and significant direct effect on knowledge application ($\beta = 0.440$, $t = 9.556$, $p < 0.001$), thereby supporting H2. In addition, knowledge application has a positive and significant direct effect on physicians' behavioural intention to adopt blockchain technology ($\beta = 0.623$, $t = 15.209$, $p < 0.001$), providing support for H3 and corroborating the findings of (Yee-Loong Chong et al., 2014).

Figure 2. The structural model of study



Source: *Authors' own work*

Table 5. Test the hypotheses within structural model

Relationships	β	Std. deviation	T statistics	P values	Results
H1: Transparency → Behavioural Intention	0.185	0.040	4.663	0.000	*Accept*
H2: Transparency → Knowledge application	0.440	0.046	9.556	0.000	*Accept*
H3: Knowledge application → Behavioural Intention	0.623	0.041	15.209	0.000	*Accept*
H4: Transparency → Knowledge application → Behavioural Intention	0.247	0.034	8.114	0.000	*Accept*

Source: *Authors' own work*

The mediation analysis further indicates that blockchain transparency has a positive and significant indirect effect on behavioural intention to adopt blockchain technology through knowledge application ($\beta = 0.247$, $t = 8.114$, $p < 0.001$). These findings confirm that knowledge application mediates the relationship between blockchain transparency and physicians' behavioural intention to adopt blockchain technology, thereby supporting H4.

With regard to the explanatory and predictive capabilities of the model, the R^2, f^2, and Q^2 values all reached acceptable levels, indicating that the proposed model possesses satisfactory explanatory power and predictive relevance. Furthermore, the model achieved an SRMR value of 0.070 and an NFI value of 0.858. These results suggest that the proposed structural model demonstrates an acceptable level of model fit and satisfactory predictive performance. The predictive quality indicators for the structural model are reported in Table 6.

Table 6. Predictive quality indicators of the study model

Components of the study form		Behavioural Intention	Knowledge Application	Indicators of the quality of the study model
R-square		0.824	0.194	SRMR = 0.070
Q^2predict		0.204	0.187	NFI = 0.858
Transparency	f^2	0.058	0.240	
Knowledge application		0.656		

Source: *Authors' own work*

6. Discussion

The present study sought to investigate the influence of blockchain transparency on physicians' behavioural intention to adopt blockchain technology, while examining the mediating role of knowledge application. To achieve this objective, an integrated conceptual model was developed to explore how these factors influence physicians' intentions to adopt blockchain technology within public hospitals. The findings are discussed in accordance with the sequence of the proposed hypotheses.

The results demonstrate that blockchain transparency exerts a positive and significant effect on physicians' behavioural intention to adopt blockchain technology. This finding is consistent with those reported by (Hoxha & Sadiku, 2019; Tran & Nguyen, 2021), who identified transparency as one of the principal determinants of blockchain adoption. Blockchain technology provides an immutable, transparent, and verifiable record of transactions, thereby strengthening users' trust and increasing their willingness to adopt the technology, even when compared with other influential factors such as security and cost reduction. The present findings also corroborate those of (Chod et al., 2020), who argued that blockchain enhances organisational transparency by providing reliable and easily accessible transaction records. Such transparency reduces information asymmetry by making trustworthy and verifiable data available across supply chains, thereby strengthening stakeholder confidence, lowering verification and financing costs, and increasing the expected value of blockchain adoption. Within the healthcare context, blockchain enables medical knowledge and patient information to be exchanged transparently, allowing physicians to access, apply, and benefit from this knowledge more effectively. Consequently, when physicians recognise the transparency afforded by blockchain technology and appreciate the unique capabilities it offers, they become more inclined to adopt and integrate it into their routine clinical practice. Therefore, hospital administrators should strengthen physicians' confidence in the transparency provided by blockchain technology and emphasise its role in facilitating access to medical knowledge, lessons learned, and evidence-based best practices.

The findings further reveal that blockchain transparency has a positive and significant direct effect on knowledge application among physicians. This result supports the work of (Peral et al., 2020), who proposed a blockchain-based methodology to address both technical and social challenges associated with data sharing and trust among multiple stakeholders by enhancing transparency in the data-sharing process. Their study demonstrated that transparency in blockchain systems is not solely derived from the technical characteristics of distributed ledgers but can be further strengthened through effective data visualisation techniques that improve the visibility and interpretability of data flows and transactions. Such transparency increases users' trust and promotes technology adoption within healthcare environments. The present findings are also consistent with (Abdulmuhsin et al., 2026), who reported that blockchain transparency substantially enhances knowledge generation within healthcare organisations by providing reliable, traceable, and tamper-resistant records, thereby increasing healthcare professionals' confidence in shared information. Their study further demonstrated that knowledge generation serves as a mechanism through which blockchain transparency translates into greater readiness to apply knowledge and adopt blockchain solutions within healthcare organisations. Accordingly, the findings of the present study suggest that transparency represents a critical enabler of effective medical knowledge application in hospitals. By providing transparent and readily accessible knowledge repositories, blockchain technology enables physicians to apply newly acquired medical knowledge more efficiently in their clinical practice. From a managerial perspective, hospital administrators should consider implementing blockchain-based medical knowledge management systems, such as blockchain-enabled electronic health records, capable of securely storing valuable clinical knowledge and best practices. Such systems would facilitate physicians' access to reliable knowledge resources, thereby contributing to improvements in healthcare quality and clinical decision-making.

The results also indicate that knowledge application has a positive and significant direct effect on physicians' behavioural intention to adopt blockchain technology. This finding is consistent with the study by (Migdadi et al., 2016), which identified knowledge application as a fundamental component in developing organisational technological capabilities. Their findings suggest that the practical application of organisational knowledge plays a decisive role in the successful adoption of electronic technologies by transforming organisational knowledge into effective operational practices that facilitate digital implementation and improve organisational performance. Similarly, the findings support those reported by (Yee-Loong Chong et al., 2014), who argued that organisations demonstrating higher levels of information systems implementation are characterised by stronger knowledge application capabilities. This perspective reinforces the view that knowledge application functions as a key enabler of successful technological innovation. By promoting shared understanding

and reducing organisational ambiguity, effective knowledge application enhances organisational readiness to adopt emerging digital technologies. Within the context of blockchain-enabled healthcare, physicians who perceive that blockchain technology enables them to access, apply, and share medical knowledge, best practices, and lessons learned, while also receiving expert guidance from senior consultants, are more likely to regard the technology as both useful and easy to use. Consequently, these perceptions strengthen their behavioural intention to adopt blockchain technology.

Finally, the present study demonstrates that knowledge application positively mediates the relationship between blockchain transparency and physicians' behavioural intention to adopt blockchain technology in public hospitals in Mosul City. To the best of our knowledge, no previous study has empirically examined this mediating mechanism, particularly within the healthcare sector. This mediating effect can be explained by the fact that blockchain transparency provides accurate, verifiable, and tamper-resistant information, thereby enhancing healthcare professionals' ability to acquire, interpret, and apply knowledge in clinical diagnosis, data exchange, and evidence-based decision-making. As healthcare professionals increasingly recognise the practical value of applying this knowledge to improve healthcare quality, enhance organisational efficiency, and reduce medical errors, their confidence in blockchain technology strengthens, resulting in a greater willingness to adopt and use blockchain-based solutions on a sustained basis. Consequently, physicians working in public hospitals in Mosul are more likely to adopt blockchain technology when they perceive high levels of transparency and recognise its ability to facilitate the effective application of medical knowledge in clinical practice.

7. Conclusion

This study examined the effect of blockchain transparency on behavioural intention to adopt blockchain technology within healthcare organisations, while investigating the mediating role of knowledge application in this relationship. The empirical investigation was conducted using survey data collected from 322 physicians employed in public hospitals in Mosul City. A structured questionnaire was specifically developed for this purpose, and the collected data were analysed using SmartPLS and SPSS.

The study was founded on the premise that the transparency inherent in blockchain technology—manifested through the provision of reliable, traceable, and tamper-resistant information—enhances physicians' ability to apply knowledge effectively in clinical practice and to make better-informed medical decisions. The findings support this proposition by demonstrating that blockchain transparency not only directly strengthens physicians' behavioural intention to adopt blockchain technology but also indirectly influences adoption through its positive effect on knowledge

application. These findings suggest that when physicians perceive blockchain as a transparent and trustworthy technology that facilitates the effective application of medical knowledge, they are more likely to recognise its practical value, develop greater confidence in its capabilities, and demonstrate a stronger intention to adopt and use it in their professional practice.

From a theoretical perspective, this study contributes to the literature by clarifying the mechanism through which blockchain transparency influences behavioural intention via knowledge application, thereby extending current understanding of blockchain adoption in healthcare settings. Practically, the findings provide valuable implications for healthcare policymakers, hospital administrators, and decision-makers by highlighting the importance of investing in blockchain technologies alongside the development of supportive knowledge management infrastructures. Such investments can facilitate the effective application of medical knowledge, strengthen healthcare professionals' confidence in digital technologies, and accelerate the achievement of sustainable digital transformation within healthcare organisations.

7.1 Theoretical Implications

The present study makes several important theoretical contributions by advancing understanding of how blockchain transparency and knowledge application jointly influence the adoption of blockchain technology within healthcare organisations. Specifically, the findings provide valuable insights into the mechanisms through which blockchain transparency facilitates technology adoption, thereby supporting healthcare organisations in making more informed decisions regarding blockchain implementation.

The study demonstrates that blockchain transparency constitutes a fundamental determinant of physicians' trust in healthcare information by enabling access to reliable, traceable, and verifiable data sources. This enhanced transparency strengthens physicians' perceptions of the technology's usefulness and consequently increases their willingness to adopt blockchain in clinical practice. Furthermore, knowledge application transforms the transparency afforded by blockchain technology into tangible organisational value by enabling healthcare professionals to utilise medical knowledge more effectively in their daily practice. In doing so, knowledge application directly strengthens physicians' behavioural intention to adopt blockchain solutions in a sustainable manner.

A further theoretical contribution lies in examining the mediating role of knowledge application, an area that has received little empirical attention within the blockchain adoption literature, particularly in healthcare settings. By demonstrating that knowledge application explains how blockchain transparency translates into behavioural intention, this study provides a more comprehensive understanding of the mechanisms underpinning technology adoption. Moreover, the

proposed framework extends beyond the healthcare context and offers insights that may be transferable to other industries seeking to implement blockchain-based digital transformation initiatives.

More broadly, this research contributes to the integration of knowledge management theory with technology adoption research by explaining how the technical characteristics of blockchain technology influence behavioural outcomes through organisational knowledge processes. In doing so, the study responds to recent calls for greater integration between digital infrastructure capabilities and organisational behaviour within digitally enabled healthcare environments, thereby enriching the theoretical foundations of both knowledge management and information systems research.

7.2 Practical Implications

The findings of this study provide several practical implications for hospital administrators and healthcare policymakers seeking to promote the successful adoption of blockchain technology within healthcare organisations. Specifically, the proposed framework offers practical guidance on how blockchain transparency can be leveraged to improve healthcare performance and enhance the quality of healthcare services.

The results demonstrate that transparency should not be regarded solely as a technical characteristic of blockchain technology but also as a strategic managerial capability that strengthens trust between healthcare professionals and the medical information upon which they rely. Increased transparency improves the reliability of clinical information, supports more accurate diagnoses, and facilitates faster and more informed clinical decision-making. Furthermore, the study highlights the importance of knowledge application as an operational mechanism that converts digital transparency into meaningful organisational value. By enabling physicians to utilise healthcare information more effectively in their daily clinical practice, knowledge application contributes to reducing medical errors, improving coordination across hospital departments, and enhancing the overall quality of patient care. These findings suggest that the successful implementation of blockchain technology depends not only on technological infrastructure but also on healthcare professionals' ability to effectively apply the knowledge generated through these systems.

From a managerial perspective, the study provides evidence supporting investment in physician training programmes and digital capability development to strengthen healthcare professionals' knowledge competencies and improve their ability to utilise blockchain-based systems effectively. Hospital administrators should also consider redesigning clinical and administrative processes to facilitate greater transparency and more effective knowledge flows throughout the organisation. Such initiatives will support sustainable digital transformation and maximise the organisational benefits derived from blockchain implementation.

Thus, this study provides practical guidance for healthcare decision-makers by advocating the adoption of technology strategies founded upon transparency, knowledge application, and organisational learning, rather than focusing exclusively on technological digitalisation. Such an approach is more likely to unlock the full value of blockchain technology and contribute to meaningful improvements in healthcare quality, organisational effectiveness, and long-term digital transformation.

7.3 Limitations and Future Research

Despite its contributions, this study has several limitations that should be acknowledged. First, the findings are based on self-reported data, which may be subject to response bias and common method bias. Second, the study was confined to physicians working in public hospitals in Mosul City, thereby limiting the generalisability of the findings to other healthcare settings or geographical contexts. Third, the proposed model focused primarily on blockchain transparency and knowledge application and did not incorporate other organisational or technological factors that may influence blockchain adoption, such as digital culture, organisational readiness, top management support, or perceived security. Finally, the cross-sectional research design restricts the ability to examine behavioural changes over time or to establish long-term causal relationships among the study variables.

Notwithstanding these limitations, the present study provides an important foundation for future research on blockchain adoption. Future studies could extend the proposed model by investigating the determinants of blockchain adoption in other sectors within Nineveh Province and across different regions of Iraq, thereby improving the external validity and generalisability of the findings. Researchers are also encouraged to enrich the current framework by incorporating additional constructs, such as trust, perceived security, privacy, organisational readiness, and digital capability, to obtain a more comprehensive understanding of the factors influencing users' behavioural intention to adopt blockchain technology.

Furthermore, future research should explore the mediating roles of other knowledge management processes, including knowledge creation, knowledge sharing, and knowledge storage, in explaining the relationship between blockchain transparency and behavioural intention to adopt blockchain technology. Examining these mechanisms would provide a deeper understanding of how blockchain-enabled knowledge management contributes to successful digital transformation within healthcare organisations and other organisational settings.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript.

Authors' contributions

All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published this version of the manuscript.

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Data availability

The datasets analysed during the current study are available from the corresponding author on reasonable request.

Appendix A. Study's Questionnaire Items

A. Blockchain Transparency (BT)

BT_item1: Blockchain technology will make the knowledge I need readily available through transparent information sharing. BT_item2: Blockchain technology will enable me to trace knowledge easily throughout work processes. BT_item3: Blockchain technology will provide me with the right information and knowledge at the appropriate time. BT_item4: Blockchain technology will provide an open and transparent system for verifying transactions.

B. Knowledge Application (KA)

KA_item1: Blockchain technology will provide various mechanisms for applying knowledge to new situations. KA_item2: Blockchain technology will enable me to apply knowledge to solve problems in different ways. KA_item3: Blockchain technology will help me make well-informed decisions in my work. KA_item4: Blockchain technology will encourage employees to apply new ideas in their work tasks.

C. Behavioural Intention to Adopt Blockchain Technology (BI)

BI_item1: I intend to use blockchain technology when the opportunity arises. BI_item2: I would like to be among the first to use blockchain technology. BI_item3: I plan to use blockchain technology in the future. BI_item4: I would recommend the use of blockchain technology to others.

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