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Article

Determinants of intention to adopt blockchain technology in oil & gas sector in Iraq

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Abstract: Blockchain technology is poised to significantly transform the corporate world, heralding a new era of innovation and efficiency. Over the past few years, its impact has been noted by leaders, academics, and government representatives around the globe this growing interest underscores businesses' need to evolve and reconsider traditional operational models. To remain competitive, organizations must embrace this change. Before introducing such ground-breaking technology, it is crucial to assess the motivations of primary stakeholders concerning its implementation. This study looks into what influences the use of Blockchain technology in the oil and gas sector, primarily using a quantitative survey of Iraqi oil and gas companies. A questionnaire was distributed among 250 top-level managers, senior executives, project managers, and IT managers for analyzing the data, the study employs the Structural Equation Modelling-Partial Least Squares (SEM-PLS) technique, with Smart PLS for data processing. The findings suggest that the intention to utilise blockchain technology is influenced by one's attitude towards it. Competitive pressure (environmental factors), functional benefit, and privacy/security (technological factors) significantly affect blockchain adoption intention. Nevertheless, there was no discernible correlation between regulatory backing and the desire to use Blockchain. Additionally, cost concern and perceived risk (organizational factors) two factors contribute negatively to the perception of blockchain technology. Besides the direct relationship, the findings revealed that attitude toward blockchain technology mediate the relationship between cost concern, perceived risk, and intention to adopt Blockchain. Built upon the Technology-Organization-Environment (TOE) model and the Theory of Reasoned Action, this research offers a comprehensive framework for investigating the intention to adopt blockchain technology. The results enhance both theoretical understanding and practical implementation by providing valuable insights into the emerging area of blockchain adoption intentions.

Keywords: blockchain; technology; oil & gas; project development; technology-organization-environment; Iraq

1. Introduction

Over the past few years, investors, consumers, and the financial services industry have all been more interested in blockchain technology (Nazim et al., 2021). The application of blockchain technology impacts the timeliness, robustness, transparency, accountability, and accuracy of supply-chain processes and transactions. For these reasons, it is an appealing option for enhancing risk management decision-making. Consequently, companies that must be ready to adapt to and prepare for uncertain and complex situations may find that the nascent blockchain technology offers a priceless opportunity (Chowdhury et al., 2023). Blockchain's unique features, including immutability, tamper-resistance, operational transparency, and traceability, can

facilitate more effective performance audits of oil and gas royalties and revenues for government organizations and business owners (Ahmad et al., 2022). On the other hand, Lu et al. (2019) noted that the oil and gas industry's management style need to be updated and characterized by low effectiveness, high expense, extended duration, and high risk. Scholars are of the view that blockchain technology has the potential to solve current inefficacies due to the unique qualities of Blockchain (Czachorowski, 2022; Lanzini et al., 2021; Masmoudi and Gargouri, 2021; Nahi et al., 2023; Nguyen et al., 2020). The literature now in publication claims that blockchain technology is disruptive, but its adoption needs to keep up with its promise. The discrepancy between the technology's present use and its potential has spurred research into the variables influencing its widespread acceptance (Marengo and Pagano, 2023). Ruangkanjanases et al. (2023) have stated that to influence organizations' intentions to use Blockchain, efforts must be made to broaden the spectrum of Blockchain applications.

However, little research needs to be done to investigate the desire to utilize. Blockchain empirically and comprehensively while simultaneously considering multiple significant elements (Haloul et al., 2024; Ruangkanjanases et al., 2023). Determining the factors impacting the adoption and use of blockchain technology is essential (Nahi et al., 2023). While studies regarding the purposes of blockchain usage have been interesting, there still needs to be more than calls for further scholarly efforts. There are few comprehensive models in the literature that describe how social influence, government regulation, perceived security, and blockchain functional benefits affect blockchain adoption (Ruangkanjanases et al., 2023). Second, as Czachorowski (2022) highlighted, technological and organizational factors need further investigation since they are the primary hindrance to digital transformation.

Iraq is now the second-largest supplier to the Organization of the Petroleum Exporting Countries (OPEC), surpassing Saudi Arabia as the primary driver of its expansion (Agha et al., 2023; Aneslagon et al., 2024). At the national level, oil has significantly contributed to Iraq's economy throughout its modern history, responsible for approximately 70% of its GDP (Ahmad et al., 2023). Many researchers predict that future drilling employing cutting-edge technology would probably unearth even greater oil reserves in Iraq due to the country's significant oil resources and relative ease of extraction. Iraq's low oil prices and unstable political environment could prevent it from meeting its long-term production goals. Localized cyber-attacks on pipelines, wells, and infrastructure; environmental effects on water and natural habitats; and the stability of integrated energy companies' financial positions are other elements that add to the scope of the issue. These all aspects need specific answers and should be discuss in detail (Agha et al., 2023). Consequently, focusing on Iraq's oil and gas industry brings new insights into implementing and adopting a revolutionary technology, Blockchain. To close these gaps in the literature, this study examines the factors influencing the intention to implement blockchain in the oil and gas business of Iraq.

The structure of the document is as follows: Our suggested theories are described in detail, together with an overview of pertinent research, in the literature review and development section. Next, the conceptual model outlines the relationships between key variables. The data analysis and findings section giving details of the data

collection process, analytical methods, and results. The discussion and conclusion interpret these findings, discussing their implications and summarizing key conclusions. Finally, the implications and limitations sections acknowledge the study's limitations and highlight its contributions to the academic community while suggesting areas for future research.

2. Literature review

2.1. Underpinning theories and hypotheses development: The Theory of Reasoned Action (TRA)

A fundamental framework for comprehending decision-making processes is provided by Ajzen and Fishbein (1975). The Theory of Reasoned Action (TRA) is the theory that predicts future behaviour based on individuals' prior attitudes and intentions. It is considered that one's views about the potential results of engaging in the behaviour in issue, as well as the evaluative components of those beliefs, determine one's attitude towards it. Conversely, the subjective norm and attitude towards executing the behaviour have an impact on intention (Albarracin et al., 2001). More accurately; a person's intention to engage in an action is influenced by their attitude towards the activity and by subjective norms, which in turn predicts the person's actual behaviour. Behavioural beliefs shape attitude, whereas normative beliefs about specific activities shape subjective norms (Ajzen and Fishbein, 1975). As a result, salient beliefs influence intentions through subjective norms or attitudes. Due to the model's unique characteristics, it provides a method for comprehending and forecasting intentions (Blue, 1995).

2.2. Technology-organization-environment (TOE)

According to the technology, organization, and environment (TOE) framework, these factors impact how quickly organizations adopt new technologies. The term "environment" in this framework refers to operational constraints and facilitators, such as trade partners' readiness, competitive pressure, sociocultural considerations, government backing, and technological infrastructure like access to competent Information and Communications Technology (ICT) consultants. Technology refers to the array of technologies available both within and outside the firm that influence the term "organization". It encompasses various characteristics, including the firm's organizational culture, including support from top management, the breadth of organizational operations, and the intricacy of the managerial structure (Awa and Ojiabo, 2016). Rooted in innovation adoption theory, the TOE model offers a comprehensive, business-friendly perspective on the aspects and challenges of implementation (Awa and Ojiabo, 2016; Faasolo and Sumarliah, 2022).

However, the TOE framework has limitations that need to be considered. As stated by Gangwar et al. (2014), the TOE framework has unclear major constructs, and the variables of the framework may vary from one context to another. Hence, the TOE framework is strengthened and enriched by integrating with TRA to design a holistic model that can predict blockchain adoption intention.

2.3. Hypotheses development

Regulatory support

One factor influencing the effective use of blockchain technology is regulatory support. It pertains to the degree to which government policies and laws enable the assimilation and execution of novel technologies (Nath et al., 2022). Organizations can operate in a favourable atmosphere by incorporating blockchain technology into their operations. Empirical studies present mixed findings regarding the impact of regulatory support on blockchain adoption. Despite this, Pham and Nguyet (2023) lend credence to the notion that legislative backing influences adoption intentions of blockchain technology in a favourable way. Pham and Nguyet (2023) findings indicate that favorable government policies and a robust regulatory framework can significantly enhance organizational readiness and willingness to invest in blockchain solutions. This suggests that regulatory bodies providing clear guidelines and support can reduce uncertainties and encourage businesses to explore and implement blockchain technology. On the other hand, regulatory backing did not significantly affect the intention to embrace Blockchain (Faasolo and Sumarliah, 2022). In a similar vein, regulatory backing had no discernible impact on blockchain adoption (Nath et al., 2022).

The mixed evidence proves the need to investigate this concept further in each context. In this context, the study suggests that regulatory support is a key factor influencing the intention to use blockchain technology. The development of this hypothesis is based on the logic that adequate regulatory support, characterized by comprehensive and transparent policies, can significantly reduce adoption barriers and foster a favorable environment for blockchain technology. Therefore, the following hypothesis is proposed:

H1: Regulatory support is expected to positively impact the intention to adopt blockchain technology.

2.4. Competitive pressure

Businesses are always looking for methods to keep a competitive edge in today's ever-changing business environment. In an environment of constant change and fierce competition, innovation is essential to establishing and maintaining excellent performance (Taouab and Issor, 2019). Iraq's oil and gas services sector is highly competitive, with numerous businesses providing comparable products and services. Having an innovation culture is not only helpful but essential for companies in the oil and gas services sector. Therefore, innovation is essential for businesses operating in the oil and gas service sector and is a crucial success factor (Khudhair et al., 2022). One of the emerging innovations that businesses are increasingly adopting is blockchain technology (Salim et al., 2022). Thus, competitive pressure will positively influence the desire to use blockchain technology. This hypothesis is supported by the understanding that firms under competitive pressure are driven to seek innovative solutions like Blockchain to maintain and enhance their performance. Given the findings from various researchers, it is clear that relative advantage and competitive pressure are important drivers of blockchain adoption. Companies striving to outperform their competitors and improve their operational metrics find blockchain

technology an attractive solution. As a result, the following theory is formed.

H2: Competitive pressure is anticipated to have a positive effect on the intention to adopt blockchain technology.

2.5. Cost concern

Blockchain technology increases business process efficiency but comes with costs associated with technology acquisition, deployment, and employee training. The expensive price of implementing Blockchain technology and the high cost of the in-depth training needed to fully understand the system negatively impacted people's attitudes (Sciarelli et al., 2022). According to Huijts et al. (2012), attitude is influenced by the perceived costs. Lule et al. (2012) found that cost negatively affects attitudes toward adopting technology. More recently, Aburbeian et al. (2022) found that price negatively influences attitudes towards technology use.

Hence, the high cost of new technology leads to unfavorable attitudes and, consequently, technology rejection. The financial burden imposed by purchasing, implementing, and maintaining blockchain technology, coupled with the investment required for adequate staff training, can create a perception that the technology is not worth the expense. By addressing the cost issue, firms may be more inclined to adopt blockchain technology, realizing its potential benefits without being deterred by the initial financial outlay. Therefore, understanding and managing the cost-related aspects of blockchain adoption is crucial for fostering a positive attitude and facilitating its integration into business processes. Based on the arguments mentioned above, the following hypothesis is proposed:

H3: Cost concerns will have a negative influence on attitudes toward blockchain technology.

2.6. Perceived risk

Several studies investigated the perceived risk-attitude link. In the realm of crypto currency, Almajali et al. (2022) discovered that perceived risk significantly negatively affects attitudes toward using crypto currency. Block chain technology can drastically alter established business paradigms. Astute corporate leaders are already investigating the potential effects of blockchain technology on their respective sectors and their competitive advantages within them. However, blockchain technology has several dangers and obstacles that might adversely affect attitudes (Prewett et al., 2020). Thus, this study proposes that:

H4: Perceived Risk will negatively influence attitudes toward blockchain technology.

2.7. Functional benefit

Many alleged advantages of blockchain technology are driving its growth and have the potential to impact user intention significantly. The visibility that blockchain technology provides to the movement of commodities, money, and information can be advantageous to a supply chain network (Lanzini et al., 2021). Because the data management method used by the oil and gas industry is outdated and is characterised by low efficiency, high cost, long duration, and high danger, Lu et al. (2019) state that

it is very necessary to investigate the functional value of Blockchain for oil and gas firms. According to Ruangkanjanases et al. (2023), among all the components impacting blockchain adoption, functional advantages are the most important. Similarly noted those functional benefits significantly predict intentions to use Blockchain.

Therefore, the oil and gas industry's propensity to adopt blockchain technology will be positively influenced by its functional benefits. This hypothesis is grounded in the belief that the practical and tangible advantages of Blockchain serve as strong motivators for adoption, driving broader and more effective implementation within the sector. Based on these arguments, the following hypothesis is formulated:

H5: Functional benefits will positively influence intention toward blockchain technology.

2.8. Privacy and security

The possibility of financial loss due to fraud or a hacker breaching the protection of an online bank user poses a risk to privacy and security (Lee, 2009). According to Alaklabi and Kang (2018), security risk refers to users' concerns that a particular technology may not be technically safe. In contrast, privacy risk relates to the confidentiality of information and the possibility that users' personal information may be disclosed to unauthorized parties. Therefore, privacy and security are critical factors in deploying and adopting any technology, especially those that handle sensitive data and require secure data transfers.

Studies have indicated that security and privacy play a significant role in determining whether or not blockchain technology is adopted. Chiarelli (2023) indicated that the efficiency and security of blockchain technology enhance its adoption. This shows that when people believe blockchain to be safe and useful, they are more likely to adopt it. Similarly, Khazaei (2020) found that perceived security significantly impacts the adoption of blockchain applications, underscoring the importance of security perceptions in adoption decisions. On the other hand, there are conflicting findings about how security worries affect blockchain adoption. For example, Kumar Bhardwaj et al. (2021) discovered that security concerns did not adversely affect SMEs' intention to use Blockchain in supply chains. Therefore, this idea has to be investigated further. In summary, a complex and vital relationship exists between security, privacy, and the desire to use blockchain technology. Their inclination to use Blockchain may grow if they believe it offers strong security and privacy guarantees. Thus, it is reasonable to assume that security and privacy will positively impact people's intentions to use blockchain technology. This reasoning leads to the formation of the following hypothesis:

H6: Privacy and security are expected to positively impact the intention to adopt blockchain technology.

2.9. Attitude toward blockchain technology

An individual's favourable or negative feelings towards behaviour are referred to as their attitude (Ajzen and Fishbein, 1975). According to Chiarelli (2023), attitude benefits behavioural intentions to adopt blockchain technology. Furthermore, research

by Mukherjee et al. (2023) demonstrated that behavioural intention for blockchain adoption is positively influenced by attitude. Therefore, oil and gas company employees will likely accept blockchain technology if they think it will improve all facets of their workflow and have a good outlook. Thus, it is proposed that:

H7: Attitude towards blockchain technology will have a positive influence on intention to adopt blockchain technology.

2.10. Mediating role of the attitude toward blockchain technology

Positive attitudes towards blockchain technology mitigate the perceived barriers posed by cost concerns. Organizations that view Blockchain favorably are more inclined to invest in overcoming initial implementation costs, viewing them as strategic investments in long-term efficiency and competitive advantages. In conclusion, understanding the mediating role of attitude towards blockchain technology provides insights into how organizations can navigate and mitigate cost concerns to enhance adoption intentions. This study also argues that a positive attitude towards blockchain technology can mediate the adverse effects of perceived risk on adoption intention. When individuals or organizations develop a favourable attitude towards Blockchain, they are likely to perceive the benefits as outweighing the risks, thus mitigating the adverse impact of these risks on their intention to adopt the technology. This positive attitude serves as a buffer, reducing the perceived severity of risks and enhancing the perceived value and feasibility of implementing blockchain technology. Therefore, costs and risks associated with blockchain adoption will hinder the implementation and usage of this technology by hurting attitudes. Therefore, the following hypotheses are formed:

H8: Attitude toward implementing blockchain technology mediates the link between concerns about cost and the intention to adopt blockchain technology.

H9: Attitude toward implementing blockchain technology mediates the relationship between perceived risk and the intention to adopt blockchain technology.

2.11. The framework of the study

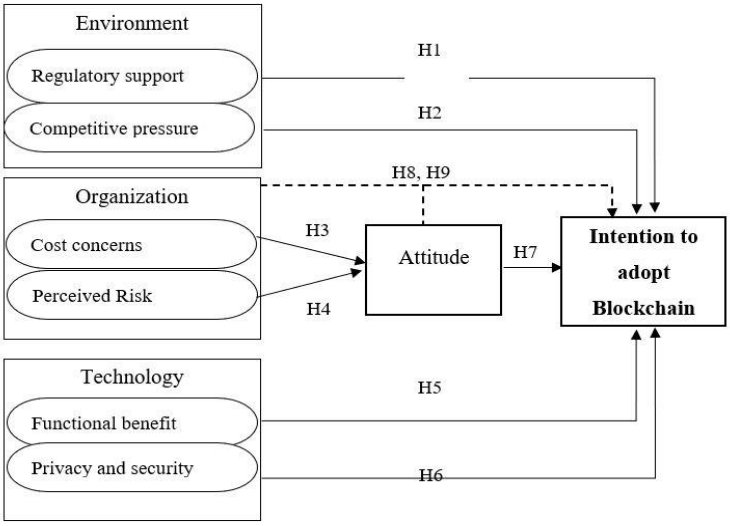

Figure 1. Conceptual model.

A conceptual framework that uses TOE variables as independent factors influencing the dependent variable of the desire to embrace blockchain technology has been constructed through a literature review. Furthermore, mediating variable between perceived risk, cost concern, and thoughts about the application of blockchain technology adoption. One may see the model in **Figure 1**.

3. Research methodology

3.1. Participants and sampling

This quantitative study adopts non-probability, judgmental sampling. The first criterion for this study is the work experience with the relevant oil and Gas Company. Only managers with at least two years of work experience in the oil and gas sector are selected as they have more awareness about this industry. Second, only top-level managers, senior executives, project managers and IT managers are considered the target population because of a) their significant contributions to decision-making, b) their awareness of cutting-edge technologies, and c) their performing tasks in the organization. An online questionnaire (Google Form) is distributed among 250 participants who work in Iraq's oil and gas companies. Based on Cohen's SEM-PLS Table, the minimal sample size needed for this investigation is established, considering nine arrows in the conceptual mode and requiring statistical power of 80% and 1% significant level.

Table 1 describes the respondents' demographic profile. Regarding age, 36 per cent of the respondents are aged between 36 and 45, 28 per cent are 46 years old and above, 26% are between 25 and 35 and only 10 per cent are aged 18–24 years old. Concerning gender, there is a considerable gender gap in oil and gas companies in Iraq. Except for two females, all the respondents are males, meaning this sector is highly male-dominated in Iraq. Regarding educational background, nearly half of the respondents have a bachelor's degree (54%), 22% have a master's degree, and only a small percentage have a PhD (5.2%). However, 18.8 per cent did not specify the educational background.

Regarding the company's experience, nearly half of the respondents have 2 years of experience, 32.4 per cent have four years or more and 20 per cent have 2–4 years. Lastly, many respondents are senior executives (40%), 24.8 per cent project managers, 21.6 per cent top managers and 13.6 per cent IT managers.

Table1. Demographic profile.

Description		Frequency	Per cent
Age	18–24	25	10.0
	25–35	65	26.0
	36–45	90	36.0
	46 and above	70	28.0
	Total	250	100.0
Gender	Female	2	0.8
	Male	248	99.2
	Total	250	100

Table1. (*Continued*).

Description		Frequency	Per cent
Education	Bachelors	135	54.0
	Masters	55	22.0
	PhD	13	5.2
	Other	47	18.8
	Total	250	100.0
Experience	Two years	119	47.6
	2–4 years	50	20.0
	Four years and more	81	32.4
	Total	250	100.0
Position	IT	34	13.6
	Project manager	62	24.8
	Senior Executive	100	40.0
	Top manager	54	21.6
	Total	250	100.0

3.2. Measures

The research variables were measured using pre-existing scales. The intention to adopt blockchain was measured using a 4-item scale from Nath et al. (2022) and three questions adapted from Kapnissis et al. (2022). Attitudes toward blockchain technology were assessed with three questions adapted from Altamimi et al. (2022) and an additional item from Almajali et al. (2022). Regulatory support was evaluated using four items developed by Wu et al. (2022) and Nath et al. (2022); competitive pressure was quantified using a 3-item scale from Wang et al. (2022). Cost concern was measured using a 3-item scale from Altamimi et al. (2022) and perceived risk was evaluated using four items adapted from Sohaib et al. (2019). Functional benefits were evaluated using five items from Ruangkanjanases et al. (2023), and privacy and security were measured with six items: four from Esfahbodi et al. (2022) and two adapted from Lallmahamood (2007).

3.3. Data analysis and results

The theoretical model proposes a relationship between a set of dependent and independent variables, which can be validated using structural equation modeling (SEM) (Beddu et al., 2024; Gefen et al., 2000; Plano Clark and Creswell, 2015). The most commonly employed methods are variance-based partial least squares (PLS-SEM) and covariance-based SEM (CB-SEM). This study opts for PLS-SEM due to the nature of the research model, which involves multiple variables. Additionally, the current research does not contain a large data set containing 250 respondents, a relatively small sample size. Thus, the PLS-SEM approach is well-suited for this study.

3.4. Structural equation modeling

This study applies the SEM-PLS methodology to evaluate the measurement and structural models. It looks at the measurement model's internal consistency,

convergent validity, discriminant validity, and external loadings. Hair et al. (2014) advised use bootstrapping for the structural model in order to ascertain the importance of path coefficients, beta values, and associated t-values.

3.5. Measurement model

Hair et al. (2011) deem Cronbach's alpha and composite reliability scores to be satisfactory when they surpass 0.80. In addition to assessing internal consistency reliability, the reliability of individual indicators is also monitored. Convergent validity has been tracked using average variance extracted, or Average Variance Extracted (AVE). AVE values greater than 0.50. Each item's AVE value is deemed sufficient in this investigation. According to Hair et al. (2014), the indicator's outer loading is significant above 0.70. As shown in **Table 2**, all loadings are in a valid range, and this study has no indicator reliability issue.

Table 2. Measurement model assessment.

Variables	Items	Outer loadings	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
Attitude	ATT1	0.911	0.906	0.917	0.598
	ATT2	0.892			
	ATT3	0.882			
	ATT4	0.889			
Competitive pressure	COMP1	0.915	0.891	0.891	0.521
	COMP2	0.914			
	COMP3	0.89			
Cost concern	COST1	0.92	0.896	0.897	0.528
	COST2	0.918			
	COST3	0.891			
	COST4	0.938			
	COST5	0.884			
Functional benefit	FB1	0.874	0.918	0.929	0.577
	FB2	0.906			
	FB3	0.884			
	FB4	0.884			
	FB5	0.86			
Intention to adopt Blockchain	INT1	0.861	0.917	0.948	0.559
	INT2	0.885			
	INT3	0.821			
	INT4	0.885			
	INT5	0.916			
	INT6	0.842			
	INT7	0.884			

Table 2. (*Continued*).

Variables	Items	Outer loadings	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
Privacy and security	Privacy1	0.851	0.931	0.931	0.542
	Privacy2	0.858			
	Privacy3	0.845			
	Privacy4	0.887			
	Privacy5	0.874			
	Privacy6	0.853			
Risk	RISK1	0.898	0.909	0.909	0.585
	RISK2	0.907			
	RISK3	0.87			
	RISK4	0.868			
Regulatory support	RS1	0.873	0.907	0.908	0.581
	RS2	0.909			
	RS3	0.882			
	RS4	0.871			

Hair et al. (2011) recommends assessing discriminant validity using the Fornell-Larcker criterion as shown in **Table 3**, bolded the Average Variance Extracted (AVE) for each construct is larger in its own row relative to the others. This confirms that discriminant validity is effectively established.

Table 3. Fornell-Larcker criterion.

Construct	1	2	3	4	5	6	7	8
Attitude	0.893							
competitive pressure	0.718	0.906						
Cost concern	0.746	0.744	0.91					
Functional benefit	0.727	0.754	0.752	0.882				
Intention	0.766	0.699	0.713	0.732	0.871			
Privacy	0.729	0.728	0.789	0.749	0.719	0.862		
RISK	0.768	0.775	0.805	0.777	0.75	0.763	0.886	
Regulatory support	0.726	0.788	0.708	0.762	0.712	0.716	0.75	0.884

3.6. Structural model and hypotheses testing

The path coefficients, *t*-statistics, and *p*-values are shown in **Table 4**. The findings show that the intention to embrace Blockchain is significantly influenced by three factors: competitive pressure, privacy and security concerns, and the functional benefits. Nevertheless, no discernible connection was discovered between the dependent variable and regulatory support. Additionally, cost concerns and perceived risk negatively and significantly affect attitudes toward blockchain technology.

Regarding the mediating relationships, the path Cost concern → Attitude → Intention was statistically supported by showing *P*-value = 0.004, this suggests that the relationship between cost concern and the intention to use Blockchain is mediated

by attitude. Furthermore, support was provided for the path Perceived risk → Attitude → Intention to embrace Blockchain. This implies that the relationship between perceived risk and the inclination to utilize blockchain is mediated by attitude, as it is shown in **Table 5** that discusses the path coefficients for indirect relationships.

Table 4. Path coefficients for direct relationships.

Hypotheses	Std Beta	*T* values	*P* values	Hypotheses result
H1. Regulatory support → Intention	0.071	0.809	0.209	Not Supported
H2. Competitive pressure → Intention	0.016	0.214	0.005	Supported
H3. Cost concern → Attitude	-0.363	5.636	0.000	Supported
H4. Perceived risk → Attitude	-0.475	7.657	0.000	Supported
H5. Functional benefit → Intention	0.176	2.346	0.010	Supported
H6. Privacy and security → Intention	0.107	1.281	0.01	Supported
H7. Attitude → Intention	0.263	2.979	0.001	Supported

Table 5. Path coefficients for indirect relationships.

Indirect paths	Std Beta	*T* statistics	*P* values	Hypothesis result
Cost concern → Attitude → Intention	−0.095	2.639	0.004	Supported
Perceived risk → Attitude → Intention	−0.125	2.734	0.003	Supported

4. Discussion and conclusion

This study looks into the main variables affecting Iraq's intention to use blockchain technology in the oil and gas industry. Digital technologies have profoundly impacted the global landscape, compelling companies to rethink and adapt their business models, strategies, and management practices. The growing attention around Blockchain indicates that businesses can no longer rely on traditional methods but must embrace transformation. As technology reshapes industrial processes, companies must be prepared to evolve (Faasolo and Sumarliah, 2022). This study looked into how the desire to use blockchain technology is influenced by competitive pressure. Compelling evidence supports the hypothesis that competitive dynamics significantly influence organizations' decisions to adopt Blockchain. These findings align with existing literature highlighting the pivotal role of competitive pressures in technology adoption decisions. Nath et al. (2022) provided evidence that the adoption of Blockchain in supply chains is positively impacted by competitive pressure, highlighting the technology's ability to improve operational efficiency and adapt to changing market needs.

Furthermore, it was postulated that regulatory backing would positively impact the inclination to use blockchain technology. Contrary to our expectations, our findings do not support this hypothesis. The findings revealed that regulatory support did not statistically impact organizations' intentions to adopt blockchain technology. These results are consistent with recent studies in the field. For example, Faasolo and Sumarliah (2022) found no apparent connection between regulatory backing and the intention to use blockchain technology. This weak link may be due to the need for

clear standards and regulations promoting blockchain adoption among Iraqi oil and gas companies.

This study delved into the influence of cost concerns on attitudes toward Blockchain, a factor underscored by compelling findings emphasizing its significant role. According to Huijts et al. (2012), attitudes toward technology adoption are significantly influenced by perceived costs. Lule et al. (2012) underscored that high costs hurt attitudes toward technology adoption. Despite Blockchain's potential to enhance efficiency and streamline processes, these initial investments and ongoing operational costs can diminish its perceived cost-saving benefits in the short term. This research underscores a negative relationship between perceived risk and attitudes toward blockchain technology. Specifically, it indicates that individuals' and organizations' willingness to adopt and positively engage with blockchain technology decreases as perceived risk increases. Typically, higher perceived risk serves as a significant barrier to technology adoption.

The relationship between the functional advantages and the intention to adopt blockchain technology has been the main subject of this research. It has been discovered that functional advantage benefits the purpose of blockchain implementation in Iraqi oil and gas enterprises. These benefits are pivotal in shaping stakeholders' perceptions and intentions regarding adoption. Recent studies underscore the pivotal role of functional benefits in shaping attitudes towards and intentions to adopt blockchain technology.

Privacy and security concerns are essential elements affecting the adoption of blockchain technology. This study shows that privacy and security positively influence the intention to adopt blockchain technology. Lee (2009) study supports this perspective, showing that security and privacy risks negatively impact intentions to use online banking services. This finding extends to Blockchain, where concerns over data breaches and privacy violations can deter potential adopters if not effectively addressed. The positive link between privacy, security, and blockchain adoption intention arises from several critical factors. Firstly, robust privacy measures protect sensitive data, fostering trust among stakeholders. Secondly, adherence to stringent security protocols mitigates unauthorized access risks and enhances blockchain transactions' reliability. Lastly, regulatory compliance with data protection laws reinforces credibility and supports wider acceptance of blockchain solutions across industries.

The hypothesis that attitude toward blockchain technology positively affects intention to adopt was strongly supported by this study, aligning with previous research in related fields. In this context, attitude refers to individuals' overall evaluation of blockchain technology. Sciarelli et al. (2022) demonstrated that a positive attitude significantly affects the intention to adopt blockchain technology. Likewise, both Namahoot and Rattanawiboonsom (2022) and Ramachandran and Stella (2022) highlighted the critical role of consumers' attitudes in the intention to adopt crypto currency platforms, emphasizing how crucial their attitude is in technology adoption scenarios.

Besides direct relationships, this study delved into the mediating role of attitude towards blockchain technology in the relationship between cost concern and intention to implement blockchain technology, finding robust support for this relationship.

Positive attitudes towards blockchain technology mitigate the perceived barriers posed by cost concerns. Organizations that view Blockchain favorably are more inclined to invest in overcoming initial implementation costs, viewing them as strategic investments in long-term efficiency and competitive advantages. In conclusion, understanding the mediating role of attitude towards blockchain technology provides insights into how organizations can navigate and mitigate cost concerns to enhance adoption intentions.

The relationship between perceived risk and the intention to use blockchain technology was also examined in this study, and the mediation effect of attitudes towards blockchain technology was shown to have strong support. The results indicate that a positive attitude can reduce the negative influence of perceived risk on adoption intentions. When individuals or organizations develop a favourable attitude towards Blockchain, they are likely to perceive the benefits as outweighing the risks, thus mitigating the adverse impact of these risks on their intention to adopt the technology. This positive attitude serves as a buffer, reducing the perceived severity of risks and enhancing the perceived value and feasibility of implementing blockchain technology. For example, IT managers concerned about the security risks of Blockchain might develop a more positive attitude if they are convinced of the technology's potential for enhancing transparency and security in operations. This shift in attitude can lead them to view the perceived risks as manageable and worth the potential rewards.

5. Theoretical and practical implications

This study offers several theoretical contributions that enhance our understanding of blockchain adoption. Applying the theory of reasoned action and the TOE framework, a model is developed to explore blockchain adoption intentions, specifically in the oil and gas sector. This study offers a comprehensive model that explains the variables affecting the intents of blockchain adoption. It also fills a vacuum in the literature by looking at Blockchain from an angle that hasn't been looked at much: the oil and gas sector.

Lastly, this study contributes to understanding how concerns cost and perceived risk shape blockchain adoption strategies. The negative relationship between perceived risk and attitudes towards Blockchain underscores the importance of addressing these risks through training, risk management, and supportive regulation. This balanced approach is essential for the broader acceptance and successful implementation of Blockchain across various industries. By addressing these challenges proactively, organizations can leverage Blockchain's transformative potential while navigating financial realities.

From a managerial standpoint, the study's findings offer several crucial implications for decision-makers in the oil and gas sector responsible for integrating blockchain technology into their supply chains. First, managers and executives can more effectively incorporate Blockchain into their supply chains by understanding the critical technological, organizational, and environmental drivers. The study's results also provide valuable insights into marketing strategies that can be used to promote blockchain adoption. Additionally, these findings help instill confidence in managers and owners about Blockchain's potential to serve as a significant source of competitive

advantage. Second, the study's conclusions help blockchain vendors and policymakers develop practical plans to hasten the use of blockchain technology by Iraqi oil and gas businesses. This survey offers essential insights by illuminating people's perceptions of blockchain adoption, a subject that has received little attention. Practitioners can use these results to address organizational, technological, individual, and environmental variables in the development and promotion of blockchain technology. Understanding the impact of attitude on adoption intention is crucial for organizations and policymakers aiming to promote blockchain technology. Efforts to enhance adoption rates should foster positive perceptions through education, demonstrate tangible benefits, and address potential concerns or misconceptions.

6. Limitations and future research direction

This research has limitations that suggest directions for future studies. Specifically, the study's focus on Iraq's oil and gas sector is a constraint. Future research could examine similar topics in different contexts and industries to evaluate the broader applicability of the proposed model. Examining different user groups with varying levels of technical expertise and cultural backgrounds could provide deeper insights into the dynamics of blockchain adoption. Secondly, the study's cross-sectional design means that data were collected simultaneously. Longitudinal studies could provide insights into how these factors change over time. Research could involve longitudinal studies to track shifts in blockchain adoption intentions. Additionally, the scope of the investigation in this study is limited, suggesting that further research could explore broader or different aspects related to blockchain adoption. Future research could delve deeper into specific factors influencing attitudes and explore how they evolve in different demographic and cultural contexts, further enriching our understanding of technology adoption dynamics.

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