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Blockchain adoption impact on real estate performance: the mediating role of real estate and blockchain transparency

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Abstract

Purpose – This study investigates the factors that lead to the adoption of blockchain technology through payment transactions and how this not only affects real estate (RE) and blockchain transparency but also RE performance.
Design/methodology/approach – Data gathered across RE firms in the United Arab Emirates (UAE) were employed to test the model. The measurement model and structural equation modeling (SEM) were used to test the items and the hypotheses illustrated in the proposed model.
Findings – Perceived financial benefits, competitive pressure and top manager support were demonstrated to successfully influence blockchain adoption (BA). Despite blockchain's early stages of development, its impact on RE operations cannot be ignored and should be more objectively examined in order to gain a better understanding of it. UAE blockchain-based companies could be seen as having a competitive advantage that maximizes resource consumption.
Originality/value – This study introduces the positive influence of blockchain technology on RE payment transactions and may advance information on how blockchain technology has the potential to change the RE sector. The paper finds its significance in exploring how RE payment systems must change to remain competitive in the market amid emerging digitalization trends.

Keywords Real estate, Blockchain adoption, Transparency, Blockchain technology, Structural equation modeling, United Arab Emirates
Paper type Research paper

1. Introduction

Recent developments in blockchain technology have driven unforeseen changes in the real estate (RE) industry (Saari *et al.*, 2022; Yeoh *et al.*, 2023). Blockchain technology has the potential to significantly alter how RE operates, its business model and how RE employees utilize it (Proskurovska and Dörry, 2022; Uchani Gutierrez and Xu, 2022). With the development of autonomous algorithmic trust controls for decentralized systems, blockchain

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technology has enabled the digitalization of decentralized business models (Chen, 2018; Papadis and Tassiulas, 2020; Sharma *et al.*, 2022).

Despite global technological developments, RE deals undergo lengthy and ineffective processes (Yeoh *et al.*, 2023). Existing RE transaction systems are stalled for various reasons, such as transparency, increased transaction costs, lengthy processes and individual prejudice (Trequattrini *et al.*, 2023). Among these problems, the payment validation procedure remains among the most contentious (Nagimova, 2022). Given the volume of signed paperwork and high-ticket transactions, frequent mistakes must be fixed during the RE sale process (Hoxha and Sadiku, 2019). According to the existing literature, blockchain emerges as a solution for industries experiencing concerns in areas such as security, data privacy and usability (Dehghani *et al.*, 2022). These key factors promote blockchain implementation in all areas and can be applied to RE transactions (Saari *et al.*, 2022). Blockchain technology maintains transaction transparency and ensures validity through smart contracts without using a dependable middleman (Morkunas *et al.*, 2019; Li *et al.*, 2022).

Blockchain technologies have garnered considerable attention from both social and commercial perspectives. Over the past 10 years, user acceptance of cryptocurrencies, such as Bitcoin, has increased significantly (Lustenberger *et al.*, 2021). Blockchain technology, which powers cryptocurrencies, has the potential to impact other commercial applications significantly. While these recent studies have emphasized the advantages of blockchain in various industries, RE remains unexplored primarily in this regard (Lambourne, 2021). The effective use of this technology is still in its early stages, as prior research has not demonstrated whether blockchain can be utilized to enable RE performance and other functionalities (e.g. competitive pressure, training and transparency) (AbdulKader & Kumar, 2022; Shamili and Muruganantham, 2022).

By revealing the value that blockchain can offer to RE performance, this study seeks to close the knowledge gap noted in the literature (Lambourne, 2021). The main objective of this research is to investigate the factors that lead to the adoption of blockchain technology through cryptocurrency payment transactions as well as how this affects not only RE and blockchain transparency but also RE performance (Morkunas *et al.*, 2019; Sharma *et al.*, 2022). Consequently, the following research questions (RQs) must be answered:

RQ1. What factors influence blockchain adoption in the RE industry? And

RQ2. Can blockchain technology support RE performance?

This study builds a research model that evaluates the association between blockchain and RE performance by drawing on the developing literature on blockchain technologies, blockchain integration with RE and technology adoption. Data gathered from the United Arab Emirates (UAE) across RE firms were employed to test the model. As one of the few nations worldwide to develop a national blockchain strategy, the UAE was selected as the case country. A dimension of the UAE agenda (UAE Cabinet, 2022) is to provide a world-class competitive knowledge economy while still adhering to fundamental ethical standards. Hence, large-scale RE development projects are increasingly being made possible by international financial flows and development experience. Thus, the UAE offers a perfect environment for evaluating the potential difficulties related to blockchain use in RE (Balasubramanian *et al.*, 2021; UAE, 2023).

The novelty of this study lies in the introduction of blockchain technology, which positively influences RE payment transactions. This study advances information on how blockchain technology can potentially change the RE sector. The paper finds its significance in exploring how RE payment systems must change to keep up with emerging digitalization trends and remain competitive. The key players of the RE market in the UAE will continue to hold their positions as long as their payment system can adapt to new constraints brought on by blockchain digitization (Averin *et al.*, 2021; Lambourne, 2021). This paper underlines blockchain's prospects for RE stakeholders in the UAE, encouraging them to pursue new

development avenues and financial security while staying true to core ethical principles of transparency, efficiency and accessibility. This research contributes to the theory by providing an interpretation through the unified theory of acceptance and use of technology (UTAUT) (Fosso Wamba *et al.*, 2020; Handoko and Lantu, 2021; Kamble *et al.*, 2021). Specifically, this study employs a modified extension of the theory to provide a suitable approach for understanding blockchain adoption in the RE field. Next, this paper proceeds with the theoretical framework, illustrating the model and hypothesis proposed. It then continues with the methodology and data analysis, culminating in the discussion and implication sections. In closing, the main conclusions of the study are drawn.

2. Theoretical framework

Monitoring performance is essential in all industries, and RE makes no exemption. This study aims to understand how the new advancements in technology – blockchain in particular – positively affect performance in RE. This section seeks to revisit the existing literature on RE, blockchain and theories concerning them to gain more insights and facilitate an enhanced understanding of the relationship between blockchain and RE performance.

2.1 Technology adoption models

This study developed a framework based on the concept of blockchain technology adoption. The model finds its foundation in the UTAUT proposed by Venkatesh *et al.* (2003) and then redeveloped over the years (Venkatesh and Zhang, 2014; Venkatesh, 2015; Venkatesh *et al.*, 2016). The theory has four fundamental concepts (performance expectancy, facilitating conditions, social influence and effort expectancy). Yet, additional factors have been added to act as moderators, including age, gender, the voluntariness of use and experience. Since then, several significant studies have used or re-examined a revised version of the original UTAUT. Additionally, the UTAUT2 extension, which combines the three constructs of hedonic motivation, price value and habit, has been widely applied and tailored to a variety of scenarios (Dwivedi *et al.*, 2017; Herrero *et al.*, 2017; Abdul-Halim *et al.*, 2021; Hunde *et al.*, 2023; Panetta *et al.*, 2023). In particular, Kamble *et al.* (2021) published a study that envisioned blockchain technology as a dynamic capability that companies should have to ensure success. This study offers a decision-supported system to forecast how a firm will successfully embrace blockchain technology using a machine learning method to be applied by leadership teams while employing UTAUT. Further literature shows that the inclination to use blockchain is significantly influenced by elements such as complexity, cost, relative advantage and competitive pressure (Wong *et al.*, 2019). Queiroz and Fosso Wamba (2019) proposed a model based on a slightly modified UTAUT; the model was ultimately validated, and the data obtained showed the presence of unique adoption behaviors among professionals in India and the United States of America.

2.2 Fundamentals in blockchain application

Blockchain technology first appeared in the Bitcoin industry over a decade ago (Nakamoto, 2008). The central component of a blockchain is a distributed database (ledger) that operates in a chain, a shared and synchronized environment wherein users verify data (Kano and Nakajima, 2018). The network has comparable functionality to that of a distributed ledger, which is maintained, updated and verified by all parties engaged in network transactions (Aste *et al.*, 2017). Blockchain technology ensures the ultimate system-wide consensus on the legitimacy of a complete history of transactions in such a network (Alam, 2022; Yao *et al.*, 2022). This concept suggests that once transactions are confirmed in a decentralized system, modifications are no longer conceivable (Chen, 2018) and that blockchains provide secure ownership. Additionally, organizations can reach the original node because every transaction can be tracked. The data are essentially arranged into blocks that form a chain, with the

current block storing data from the preceding block (Li *et al.*, 2018). Hence, applications based on blockchain have the potential to improve processes in the RE industry (Latifi *et al.*, 2019). Currently, the RE industry still holds extreme importance in the economies of most countries, providing more valuable outcomes than the stock market or other financial markets (Shiller, 2014). Thus, evaluating how this market can evolve is essential while understanding how the industry can be improved by adopting blockchain technology.

2.3 The role of blockchain adoption, secure payment transactions and RE performance

Concerning RE, numerous theories state how market prices represent all information currently accessible (Salzman and Zwinkels, 2013). However, according to Case and Shiller (1988), specific data, including actual interest rates, are not reflected in prices. Additionally, according to research, high-cost transactions make RE markets less efficient. The literature claims that blockchain technology can significantly alter the theory governing the RE transaction process by enhancing the speed and efficiency of due diligence procedures, RE title registration procedures, simplification of complex RE bureaucratic and payment transactions and streamlining transaction turnaround times (Nijland and Veuger, 2019). A significant change in the market occurred when the first cryptocurrency was developed on the blockchain (Zhang and Yang, 2019; Papadis and Tassiulas, 2020). Secure decentralized financial transactions are now guaranteed by cryptocurrencies, particularly Bitcoin (which has blockchain technology at its foundation). Peer-to-peer currency transactions are possible with Bitcoin without the involvement of a central authority (Chaum, 1983). Since the creation of Bitcoin, there have been numerous types of cryptocurrencies. Still, none have had a revolutionary impact like Ethereum (the second-most popular cryptocurrency), which allowed businesspeople to transform whole sectors owing to its customizable blockchain. Thus, efficiency is another central point in favor of blockchain adoption. Although estimates vary significantly, it is widely believed that Bitcoin can process 3–7 transactions per second, and Ethereum can process approximately double that number (Papadis and Tassiulas, 2020).

Countries such as Georgia, India and Sweden are already developing pilot initiatives toward blockchain adoption, achieving concrete changes. Purchasers will be assured that the property they are acquiring is the correct lot and that the seller is, without a doubt, the owner (Hoxha and Sadiku, 2019). Owing to fewer conflicts, transactions will take less time and, consequently, will be less expensive for the firm. The utilization of this technology has resulted in a tremendous increase in efficiency, accuracy and transparency. Moreover, it gives users rapid access to a comprehensive and permanent transactional history for each property while ensuring the validity of payments and land records. It would also enable them to track the status of the property and the sale deed in almost real-time (Schnauss and Giannotta, 2021). The UAE is not a transparent environment regarding prices and payments, and it can be challenging for experienced professionals to go through the entire transaction process (Dunse *et al.*, 2018). Most industries in the UAE are beginning to understand this technology, its benefits and its possible drawbacks (Nagimova, 2022). Introducing cryptocurrencies into payment transactions is now one of the main advancements in the field of RE (Maneejuk *et al.*, 2022). This study aims to analyze the above challenges to provide new insights into how this technology positively impacts RE performance.

3. Hypothesis development

Considering the early stages of blockchain technology development, all constructions were developed from existing research on UTAUT (Venkatesh *et al.*, 2003). Reviewing the research on UTAUT, characteristics including performance expectation, perceived financial benefits, competitive pressure, training and education and top managers' support were shown to

predict blockchain adoption (Fosso Wamba *et al.*, 2020). Furthermore, blockchain transparency and RE transparency were derived from the literature relevant to performance and RE (Li *et al.*, 2022). The questions for each concept are listed in detail in Appendix 1.

3.1 Performance expectancy

The degree to which employees expect that using a system (blockchain-enabled) would facilitate them in improving their performance at work is known as performance expectancy (Venkatesh *et al.*, 2003). Performance expectation relates to how much an employee believes utilizing blockchain technology will increase productivity and performance. Employees' desire to adopt and use new technology is correlated with how beneficial (or advantageous) they perceive the technology to be in their daily work activities (Weerakkody *et al.*, 2013). Thus, the study suggests the following hypothesis.

H1a. Performance expectancy (PE) has a positive significant effect on blockchain adoption.

3.2 Perceived financial benefit

Perceived financial benefit refers to the cash advantage obtained from technology and its operational and implementation expenses (Lee *et al.*, 2012). In a blockchain-based system, third-party middlemen are no longer necessary and transactions can be initiated and carried out peer-to-peer. Businesses experience cost savings and increased flexibility (Kamble *et al.*, 2018, 2020a, b). Blockchain-driven companies are said to have lower overhead costs than conventional businesses and more significant revenue (Tapscott *et al.*, 2019). New technology's perceived usability and value are tied to perceived financial rewards (Lee *et al.*, 2012). As a result, the research postulates that:

H1b. Perceived financial benefits (PFB) have a positive significant effect on blockchain adoption.

3.3 Competitive pressure

Competitive pressure is the level of demand an organization and its employees experience in the same sector (Zhu and Kraemer, 2005). RE businesses can use contemporary technology to outperform their rivals. Most companies would like to take advantage of the ability to construct various applications using blockchain technology in the increasingly competitive market reality (Song *et al.*, 2022). Hence, firms may be able to change the game's rules and take advantage of fresh opportunities to outperform their rivals, thus altering the nature of the industry's competitive landscape (Porter, 1999). It is anticipated that businesses that use blockchain technology will have a competitive advantage over their rivals (Kosba *et al.*, 2016). Consequently, the study assumes that:

H1c. Competitive pressure (CP) has a positive significant effect on blockchain adoption.

3.4 Training and education

The lack of qualified human resources has prevented the implementation of new technologies. Owing to the lack of technically trained workers to deploy and manage blockchain technology, many firms have been forced to hire and educate employees to build a talent pool (Rizzo, 2021). Staff will have better knowledge and use of the technology with proper training and instructions (White, 2017). Consequently, this study hypothesizes that:

H1d. Training and education (TRE) have a positive significant effect on blockchain adoption.

3.5 Top managers' support

According to Odoyo and Ojera (2020), top management support refers to the extent to which top management is active in information system operations and is aware of the strategic relevance of information system functions. To assist a business in overcoming any obstacles and foster a culture of dedication and creativity, top management support offers a compelling vision. It has been discovered that top management support affects how easily usable and helpful something is perceived (Gangwar *et al.*, 2015). Accordingly, this paper proposes the following hypothesis:

H1e. Top managers' support (TMS) has a positive significant effect on blockchain adoption.

3.6 The role of blockchain adoption and transparency

Organizations must develop, deploy and manage blockchain as a fundamental technology. It can assist in integrating many RE features, creating a more dependable environment (Viriyasitavat *et al.*, 2018). Although it is a complex topic in many ways, companies may accomplish considerable performance improvements in the RE market with blockchain technology (Kshetri, 2017), resulting in greater transparency. Blockchain can ensure trust in these situations by raising the industry's transparency (Lu and Xu, 2017; Thakur *et al.*, 2019; Transparency International, 2021). Therefore, this research considers the following:

H2a. Blockchain adoption has a positive significant effect on RE transparency.

H2b. Blockchain adoption has a positive significant effect on blockchain transparency.

3.7 The role of blockchain adoption and RE performance

RE businesses that employ blockchain technology may be viewed as having a competitive advantage that maximizes resource use (Hughes *et al.*, 2019). Any company can create value through effectiveness (e.g. lowering transaction costs and streamlining transaction flow), novelty (e.g. engaging in a series of novel activities), complementary assets (e.g. providing complementary goods and services) and lock-in (e.g. creating customized products and preventing client churning), all of which significantly improve the core competitiveness of RE firms and lead to long-term growth (Pati *et al.*, 2018). RE companies also aim to implement real-time control of operations, which may reduce delivery times and boost transaction efficiency (e.g. monitoring and processing payments immediately and reducing transaction error rates) (Chung and Lee, 2020). As previously mentioned, blockchain technology offers technical assistance for more effective business implementation while improving information transparency, which promotes efficiency changes. Finally, this development will enhance the company's performance (Lee, 2019; Harris and Nikbakht, 2021). Therefore, the study assumes the following:

H3. Blockchain adoption (BA) has a positive significant effect on RE performance.

H4. RE transparency (RET) has a positive significant effect on RE performance.

H6. Blockchain transparency (BT) has a positive significant effect on RE performance.

H5. RE transparency mediates the relationship between blockchain adoption and RE performance.

H7. Blockchain transparency mediates the relationship between blockchain adoption and RE performance (REP).

4. Materials and methods

4.1 Data collection

This research examines how blockchain adoption affects the RE performance of organizations using quantitative methodology, which is the most appropriate method when investigating a specific topic of interest (Field *et al.*, 2022). Before the official data collection process through a survey, a pilot test was administered among ten RE leaders to ensure that content and language were appropriate to the target audience. Once all comments were collected, appropriate modifications were carried out accordingly. A reputable survey website (SurveyMonkey.com) was utilized to administer the questionnaire online and through social media (LinkedIn, WhatsApp and Telegram). The platforms were chosen based on the high activity registered among RE professionals in the UAE (The United Arab Emirates' Government portal, 2023). In addition, three leading RE firms were directly approached to provide a more forthright selection in the sample. All potential participants were briefed about the context and aim of the study before being able to contribute through informative introductions on various social media.

4.2 Sampling frame

The RE professionals sampled have all experience working with blockchain-enhanced payment transactions and were currently employed in UAE RE firms at different levels of seniority. To guarantee that each respondent had prior exposure to blockchain technology, only RE businesses actively advertising cryptocurrency payments were approached (based on marketing campaigns or company websites).

4.3 Measurement scale

A five-point Likert scale (ranging from "strongly disagree" to "strongly agree") was used to evaluate each question. All items were selected from the existing literature (Fosso Wamba *et al.*, 2020; Kamble *et al.*, 2021; Li *et al.*, 2022; Queiroz and Fosso Wamba, 2019), while minor modifications were applied to meet the research context and audience language registry.

4.4 Demographic analysis

Of approximately 700 professionals who consented to participate, 279 valid replies were included in the sample, resulting in a response rate of 40%. Table 1 illustrates the respondents' demographics. About 34% of respondents were female, while male respondents constituted the majority, with 63% of responses being collected. This suggests that males constitute the majority of professionals in the RE field in the UAE. Of the sample, 39% were 34–41 years old, 47% achieved bachelor's degrees, 49% were employed in a junior position ("employees") and 40% were employed in a private RE firm at the time of data collection. Most respondents declared earnings between 50,000 and 100,000 per year (44%).

5. Data analysis

The measurement model and structural equation modeling were used to test the items and the hypothesis illustrated in the proposed model. Considering simplicity and accuracy, SmartPLS (4th version) software was chosen to run the results.

5.1 Measurement model assessment

The measurement model's initial assessment was done to confirm the validity and reliability of the constructs and their dimensions (Hair *et al.*, 2019). Of the 36 items proposed, PE4 was eliminated from the measurement model evaluation since the factor loadings were not above the recommended threshold of 0.60. Therefore, the final measuring model included all the

Item	*n*	%
Sex		
Male	176	63
Female	103	34
Age		
18–25	42	15
26–33	84	30
34–41	107	39
42–49	36	13
50þ	10	3
Highest educational level		
Diploma/polytechnic	25	9
Bachelor's degree	132	47
Postgraduate degree (Master/Ph.D.)	90	33
Other(s)	32	11
Types of firms		
State-owned	19	7
Foreign	54	19
Joint venture	78	28
Private	111	40
Others	17	6
Job positions		
General manager	8	3
Deputy manager	31	11
Supervisor	99	36
Employee	138	49
Others	3	1
Income (USD)		
<10,000	17	6
10 to 50	63	23
50 to 100	122	44
100 to 500	70	25
>500	7	2

Source(s): Developed by authors

Table 1. Demographic profile ($n = 279$)

questions, minus P4, which improved reliability and validity results. Table 2 demonstrates that all factor loadings exceed or are close to the recommended limit of 0.60. Additionally, all the items were equal to or greater than the indicated values of 0.50 and 0.70, respectively, for average variance extracted (AVE) and composite reliability (CR). As a result, convergent validity and reliability were generated. Additionally, Table 3 displays the outcomes for discriminant validity according to the heterotrait-monotrait ratio (HTMT), also establishing a proper correlation ratio between items. The values above 0.85 were still present in the critical region, indicating a strong connection between similar items; therefore, the similarity is permissible (Field *et al.*, 2022).

5.2 Structural model assessment

The BA, BT, RET and REP findings showed R2 values of 0.188, 0.238, 0.232 and 0.591, respectively. Since the R2 values were higher than the necessary level of 0.10, they validated the model's in-sample predictive capability (Field *et al.*, 2022). In this paper, the modified

	Λ	α	CR	AVE
Modified UTAUT				
PE		0.696	0.831	0.623
PE1	0.692			
PE2	0.806			
PE3	0.711			
PE4	−0.521			
PFB		0.857	0.903	0.699
PFB1	0.817			
PFB2	0.862			
PFB3	0.827			
PFB4	0.837			
CP		0.832	0.882	0.600
CP1	0.692			
CP2	0.796			
CP3	0.859			
CP4	0.783			
CP5	0.732			
TRE		0.754	0.859	0.674
TRE1	0.679			
TRE2	0.885			
TRE3	0.881			
TMS		0.789	0.860	0.607
TMS1	0.820			
TMS2	0.673			
TMS3	0.808			
TMS4	0.806			
BA		0.808	0.887	0.724
BA1	0.825			
BA2	0.906			
BA3	0.819			
RET		0.783	0.853	0.541
RET1	0.584			
RET2	0.753			
RET3	0.837			
RET4	0.775			
RET5	0.704			
BT		0.790	0.887	0.724
BT1	0.699			
BT2	0.840			
BT3	0.851			
BT4	0.739			
REP		0.785	0.858	0.604
REP1	0.832			
REP2	0.836			
REP3	0.753			
REP4	0.676			

Table 2.
Item loadings, reliability and convergent validity

Source(s): Developed by authors

UTAUT (MUTAUT) variables (PE, PFB, CP, TRE and TMS) predicted BA, while REP was predicted by BA, RET and BT, as shown in Table 4.

The second phase involved evaluating the structural model test after the mandatory examination of the measurement model. The hypotheses were individually examined. The direct impact of the independent variables PE, PFB, CP, TRE and TMS on BA was first examined. The second phase inspected how directly BA affected REP. The direct impact of

	BA	BT	CP	PE	PFB	REP	RET	TMS	TRE
BA									
BT	0.604								
CP	0.449	0.595							
PE	0.315	0.500	0.517						
PFB	0.418	0.340	0.596	0.524					
REP	0.898	0.453	0.495	0.493	0.601				
RET	0.595	0.813	0.544	0.539	0.419	0.566			
TMS	0.406	0.494	0.700	0.384	0.694	0.580	0.574		
TRE	0.394	0.432	0.873	0.547	0.578	0.509	0.500	0.638	

Source(s): Developed by authors

Table 3.
Discriminant validity

Hypothesis	Relations	B	SD	*t*-value	*p* value	Decision
H1a	PE → BA	0.061	0.061	1.011	0.156	Rejected
H1b	PFB → BA	0.149	0.076	1.950	0.026	Supported
H1c	CP → BA	0.194	0.068	2.842	0.002	Supported
H1d	TRE → BA	0.024	0.070	0.350	0.363	Rejected
H1e	TMS → BA	0.119	0.072	1.645	0.050	Supported
H2a	BA →RET	0.482	0.055	8.764	0.000	Supported
H2b	BA → BT	0.488	0.051	9.647	0.000	Supported
H3	BA → REP	0.722	0.036	19.783	0.000	Supported
H4	RET → REP	0.166	0.048	3.433	0.000	Supported
H6	BT → REP	0.089	0.053	1.678	0.047	Supported
H1	MUTAUT → BA	0.434	0.061	7.079	0.434	Supported

Source(s): Developed by authors

Table 4.
Structural model (direct relations) – Path coefficients

RET and BT on REP was then observed. Afterward, the validation of the outer order construct was implemented, analyzing the direct effects of MUTAUT on BA. Ringle *et al.* (2010) used the bootstrap resampling approach with 10,000 resamples to determine the importance of direct pathways. Finally, the impact of BA on REP was evaluated via the use of REP and BT.

5.3 Mediation analysis

H5 and H7 assess whether RET and BT act as a mediating factor in the relationship between BA processes and REP. In the case of RET mediating the relation between BA and REP, the results showed a positive significance, providing a full mediation. However, BT showed insignificant results and was thus rejected as a mediator. As a result, H5 is approved, while H7 is rejected. Table 5 displays the findings of the mediation study.

5.4 Results

In accordance with existing literature on blockchain adoption, the results of the hypotheses verification in the outer model were verified, giving crucial insights and confirming new

Hypothesis	Relations	B	SD	*t*-value	*p* value	Decision
H5	BA → RET → REP	0.080	0.026	3.046	0.001	Supported
H7	BA → BT → REP	−0.044	0.027	1.602	0.055	Rejected

Source(s): Developed by authors

Table 5.
Mediation results

frameworks for integrating blockchain into the RE environment (see Figure 1). Figure 2 shows the structural model with the respective results.

Our study's findings are significant, particularly in relation to the construct MUTAUT (H1) and its influence on blockchain adoption (BA). By breaking down the item into five selected indicators, we can better understand the construct's dynamics. The association between PE and BA was proven insignificant (B = 0.061, SD = 0.061, $p > 0.05$) in this context, rejecting H1a. However, the relationship between PFB and BA was confirmed to be strong (B = 0.149; SD = 0.076, $p < 0.05$), supporting H1b. Similarly, CP and BA showed a significant relation (B = 0.194, SD = 0.068, $p < 0.05$) in the context of RE, confirming H1c. This study also showed how TRE and BA do not have a significant relation (B = 0.024, SD = 0.070, $p > 0.05$) in the depicted settings, rejecting H1d. H1e postulates that TMS and BA have a connection (B = 0.119, SD = 0.072, $p < 0.05$); the relationship has been confirmed as expected.

H2a and H2b hypothesize a positive relationship between BA and, respectively, RET and BT. As predicted, the relationships proved to be strong, supporting both H2a (B = 0.482, SD = 0.055, $p < 0.05$) and H2b (B = 0.488, SD = 0.051, $p < 0.05$). The study also postulates a positive connection between RET, BT and REP, proving that transparency is among the most

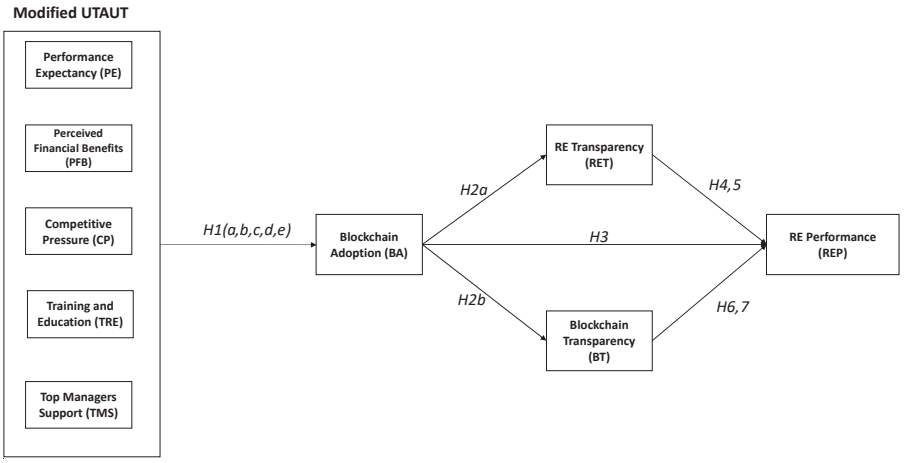

Figure 1.
Theoretical framework

Source(s): Developed by authors

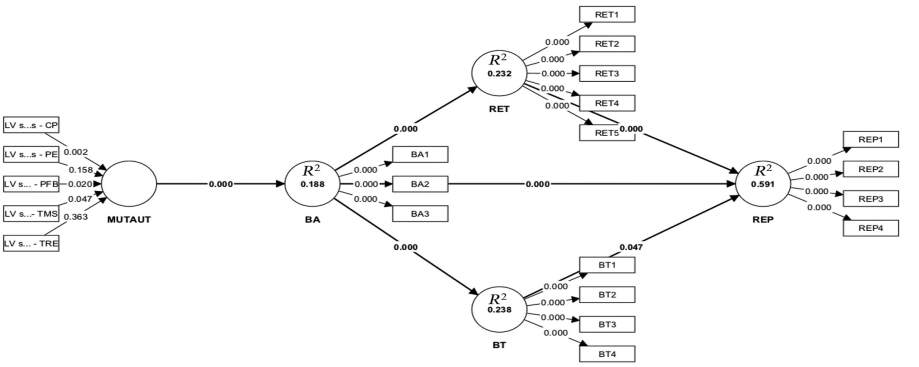

Figure 2.
Structural model

important conditions for conducting business in RE. Both relationships have, once again, proven significant, supporting H4 (B = 0.166, SD = 0.048, $p < 0.05$) and H6 (B = 0.089, SD = 0.053, $p < 0.05$). Lastly, H3 proposes a positive integration between BA and REP. As the founding theme of this study, the research suggests how REP can increase with the introduction of blockchain technology. The analysis validates this assumption (B = 0.722, SD = 0.036, $p < 0.05$), supporting H3.

H5 and H7 are concerned with the mediators. The study postulates that RET and BAT are mediators in the relationship between BA and REP. According to the results, transparency is an important performance predictor. Hence, this study attempts to explain how BA affects REP. While the results for H5 (B = 0.080, SD = 0.026, $p < 0.05$) were significant and supported, H7 scored a p-value quite close to the threshold but still greater than 0.05, showing that BT did not significantly mediate the relationship. H7 (B = −0.044, SD = 0.027, $p > 0.05$) is rejected. This does not prevent a significant relationship *per se*, as both H4 and H6 are supported; however, it provides insights about the relations in the construct. Though the direct effects are valid, BT did not show any indirect effect on REP.

6. Discussions

This study is successful in providing adequate answers to its two RQs. The first RQ is reflected in H1, proposing five different variables that may be appropriated to influence BA. The outcomes showed that PE and TRE are not the appropriate parameters for defining blockchain adoption in the UAE; however, PFB, CP and TMS were demonstrated to influence BA successfully. This testifies that, while the literature provided strong foundations in the relationship between PE and BA, the UAE context may offer a new reality to this dynamic. PE describes an advantage perceived on an individual level. This study analyzed the variable from the point of view of a single employee, disregarding the working dynamics and the decision-making process at work in the UAE. Given the context, future research may generate more interesting results when addressed to top managers, as they would be more knowledgeable about what could aid the company in attaining gains in job performance.

The second RQ aimed to understand if blockchain technology can provide advantages to the RE industry and support its performance. H3 postulates that BA has a positive and significant effect on REP. The findings confirmed the validity of this correlation, demonstrating clearly that blockchain is a useful technology for developing RE performance in the UAE. H2, H4 and H6 focused on the dynamic of this relationship, adding transparency to the equation. The choice of this variable was brought up by the role transparency covers in both blockchain and RE. As stated above, in the UAE, blockchain technology provides technological support for more efficient company execution while enhancing information transparency. Despite blockchain being in its early stages of development, the results demonstrate that its impact on RE operations cannot be ignored. Instead, it should be more objectively examined to better understand it within the UAE context or in adapting the research to different contexts. UAE blockchain-based companies could be seen as having a competitive advantage that maximizes resource consumption. Additionally, RE firms that aim to integrate real-time control over operations will experience shorter delivery times and increased transaction efficiency (by, for example, lowering transaction error rates).

7. Implications

7.1 Theoretical contributions

This research offers significant theoretical insights that can address current RE management challenges and present new opportunities in the digital era. First, this paper is the first to establish a direct relationship between transparency, RE and blockchain. The research model

demonstrates that these three main elements form the core of analyzing how blockchain-enabled payment transactions enhance productivity in RE organizations. Furthermore, introducing real estate transparency as a mediator in the model illustrates how blockchain could influence relationships and transactions in the RE industry. It achieves this by preserving a single source of immutable truth, automating transactions, facilitating visibility across disparate systems, significantly reducing imbalances, streamlining processes and enabling near-real-time reporting instead of relying on historical data.

Second, this research elucidates how blockchain technology transforms the complexity and dynamics of the RE sector. Employing the MUTAUT theory and the proposed theoretical model, this study pioneers a research stream focusing on blockchain's impact on RE performance. The findings confirm that blockchain is an effective and viable solution for enhancing RE efficiency. Reflecting on the conclusions of the literature (Yeoh *et al.*, 2023), this research reveals that blockchain in RE improves connectivity, visibility and information exchange, significantly influencing organizational productivity. The study demonstrated that blockchain technology could become a financially viable technological asset in the UAE with appropriate technical resources and motivation. Also, this study provides empirical support for the previously conceptual claims regarding blockchain's potential for integration into existing organizational processes and its adoption for achieving real estate performance objectives (Queiroz and Fosso Wamba, 2019).

Third, by expanding the MUTAUT, this study significantly advances the understanding of technology adoption in the RE sector. It revisits a theory seldom applied in RE research, as Alalwan *et al.* (2017) highlighted, offering new insights into how RE businesses might navigate the adoption of blockchain technology. This research and the associated findings pave new paths for investigating blockchain adoption within the RE industry and enrich the broader discourse on technology adoption across fields.

7.2 Practical implications

This research has important implications for RE stakeholders. The first implication is that RE stakeholders need to consider blockchain technology a competitive advantage. The findings indicate that blockchain can directly maximize profits and showcase its impact on performance, providing all the necessary tools to elevate the industry across various levels. Beyond profit, blockchain enables UAE's RE firms to enhance the company's public image and deliver projects and products more efficiently. It supports effectiveness (by reducing trading costs and improving process efficiency), innovation (through engaging in novel activities), core competencies (by offering supplementary goods and services) and lock-in strategies (developing customized products to prevent client churn), thereby enhancing RE firms' core competitiveness and fostering long-term growth. Furthermore, the practical implications extend to the government level, reinforcing blockchain's role as a "strategic technology" in improving communication, collaboration and innovation between entities and government land departments (UAE, 2023).

Second, understanding the implications of blockchain adoption in the UAE, particularly from a Sharia perspective, is crucial. Through an analysis that focuses on transparency, security and compliance, among other factors, this study identifies potential opportunities and challenges arising from this convergence. Since blockchain and Islamic principles share core values of ethics, trust and openness, they are perfectly aligned to foster financial innovation while adhering to moral standards. RE, an essential asset class in Islamic finance symbolizing stability, tangibility and long-term value, is on the brink of transformation by blockchain technology, especially in the UAE. This paper demonstrates that integrating blockchain technology with RE has revolutionary potential, poised to disrupt traditional practices and guide the sector toward greater sustainability and resilience. A third

implication suggests that stakeholders in the RE sector, including conveyancers, RE agencies, financial institutions, government entities and professional associations, collaborate to create a blockchain network. Such a network would significantly enhance RE settlements and ecosystem growth by implementing blockchain-enabled procedures. Furthermore, the insights provided here also serve as valuable guidance for stakeholders in sectors beyond RE, highlighting the advantages of adopting new technologies.

7.3 Limitations and future research

Despite the efforts to increase the investigation's quality, this research recognizes several limitations and regards them as potential areas for further study. This study represents an advancement in the literature on integrating blockchains with RE; however, additional studies are still necessary. PFB, CP and TMS are the three components the proposed model successfully takes into account to predict blockchain adoption. Still, future research may individualize more predictors to promote progress in this field. For instance, digitalized management (Li *et al.*, 2021), organizational culture (Orji *et al.*, 2020) and information security (Kamble *et al.*, 2021) may be used. Furthermore, essential factors like blockchain transparency and the effect of the technology on performance and RE transparency require more research to comprehend direct and indirect relationships. Another drawback of this research is that other bureaucratic or operational transactions and their possible benefits to the industry were not explored in the analysis of the blockchain payment transactions. This gap can be filled in future research by modifying the proposed model.

8. Conclusion

Employing the MUTAUT theory, this paper empirically investigated the critical factors influencing the adoption of blockchain technology in RE payment transactions and their effects on blockchain transparency and RE performance. Utilizing data from RE stakeholders across the UAE and applying both the measurement model and structural equation modeling, our study provided a thorough analysis of the determinants of blockchain adoption. The findings highlighted the crucial roles of perceived financial benefits, competitive pressure and top manager support in facilitating blockchain adoption within the sector. This research pioneered the articulation of blockchain's positive impacts on RE payment transactions, contributing to the discourse on the digital transformation of the RE sector. It underlined the need for RE payment systems to evolve to maintain market competitiveness amid rapid digitalization trends. Ultimately, this study not only paved the way for future research into the transformative potential of blockchain in RE but also emphasized the strategic need for firms in this sector to adapt and thrive in an increasingly digital landscape.

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Appendix

PE1 *I find blockchain technologies useful in my job*	Performance expectancy (Queiroz and Fosso Wamba, 2019)
PE2 *Using blockchain technologies enables me to accomplish tasks more quickly*	
PE3 *Using blockchain technologies increases my productivity*	
PE4 *If I use blockchain technologies, I will increase my chances of getting a raise*	
PFB1 *Using blockchain technologies enables reductions in the operating costs*	Perceived financial benefits (Kamble *et al.*, 2021)
PFB2 *Using blockchain technologies enables reductions in the transaction costs*	
PFB3 *Using blockchain technologies enables to add new customers and increase profitability*	
PFB4 *Using blockchain technologies enables to retain existing customers increasing profitability*	
CP1 *Blockchain offers competitive advantages*	Competitive pressure (Kamble *et al.*, 2021)
CP2 *Competitors are in the process of implementing blockchain*	
CP3 *Competitors will become more competitive with blockchain implementation*	
CP4 *Competitors will have improved processes with blockchain implementation*	
CP5 *Competitors will have reduced transaction time and costs with blockchain implementation*	
TRE1 *Training about blockchain improves level of understanding on blockchain substantially*	Training and education (Kamble *et al.*, 2021)
TRE2 *Organization provides complete training on blockchain*	
TRE3 *The training programs on blockchain increased my confidence*	
TMS1 *Blockchain is seen with strategic importance by our top management*	Top managers support (Kamble *et al.*, 2021)
TMS2 *Top management is prepared to take the risks associated with blockchain implementation*	
TMS3 *Top management promotes the culture of transparency and accountability acquired through information sharing*	
TMS4 *Top management have exhibited strong leadership and engagement while adopting ICT innovations in the past*	
RET1 *Blockchain could improve the following tasks: e.g. recording transactions and transferring quantities of assets*	Real estate transparency (Fosso Wamba *et al.*, 2020)
RET2 *Blockchain could improve the following tasks: e.g. tracking purchase orders, change orders, receipts, notifications or other trade-related documents*	
RET3 *Blockchain could improve the following tasks: e.g. assigning or verifying purchase*	
RET4 *Blockchain could improve the following tasks: e.g. linking physical goods to serial/transaction numbers*	
RET5 *Blockchain could improve the following tasks: e.g. sharing information about process and sales*	
BT1 *I believe blockchain enabled processes are transparent*	Blockchain transparency (Fosso Wamba *et al.*, 2020)
BT2 *I believe stakeholders will enable me to have a better understanding of how blockchain-enabled applications work*	
BT3 *I believe stakeholders will provide me with in-depth knowledge of blockchain applications*	
BT4 *I believe I will have opportunities to provide feedback on blockchain-enabled applications*	

(*continued*)

Table A1. Questionnaire

BA1 *My company invests resources in blockchain-enabled RE applications*	Blockchain adoption (Fosso Wamba *et al.*, 2020)
BA2 *Business activities in my company require the use of blockchain technologies*	
BA3 *Functional areas in my company require the use of blockchain technologies*	
REP1 *Development of new products or services are successful in my RE firm*	Real estate performance (Li *et al.*, 2022)
REP2 *Development of employee careers is promising in my RE firm*	
REP3 *My RE firm has a strong competitive advantage*	
REP4 *My RE firm has a good public and social image*	

Table A1.

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