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The Influence of Blockchain-based Smart Contracts on Arbitration Speed: The Mediating Role of Trust in the Arbitration Process

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Abstract

This study investigates the influence of blockchain-based smart contracts on arbitration speed and explores the mediating role of trust in the arbitration process. Utilizing a quantitative research approach. A date was collected from a sample of 202 experienced legal practitioners and arbitrators through online survey in the realm of blockchain-based smart contracts was analyzed to examine the relationships and effects concerning the employing of smart contracts, trust, and arbitration speed. Statistical tools were used to prove the study model. The study provides empirical evidence on the relationship between smart contracts and arbitration speed, highlighting the potential benefits of their implementation. The findings of this study have significant implications for policymakers, legal practitioners, and stakeholders involved in arbitration, as they shed light on the potential advantages of integrating smart contracts into the arbitration process. By leveraging the transparency, security, and automation features of blockchain technology, smart contracts have the potential to streamline arbitration proceedings, expedite resolution times, and enhance overall trust in the process.

Keywords: Blockchain-based, Smart Contracts, Arbitration Speed, Trust in Arbitration Process

1. Introduction

In recent years, the rapid development and adoption of blockchain technology have given rise to the emergence of smart contracts, which are self-executing contracts with the terms and conditions of the agreement directly written into code. Smart contracts hold the potential to revolutionize various industries, including arbitration, by providing a more efficient, transparent, and secure means of resolving disputes. This study aims to investigate the relationship between the use of blockchain-based smart contracts and the speed of arbitration, with trust in the arbitration process as a mediating variable.

Arbitration, as an alternative dispute resolution mechanism, has gained popularity due to its efficiency, flexibility, and cost-effectiveness compared to traditional court litigation. However, the arbitration process can still be time-consuming and complex, particularly in cases involving cross-border disputes and intricate legal issues. Blockchain-based smart contracts offer the possibility of streamlining and automating various aspects of the arbitration process, potentially leading to faster and more effective resolution of disputes.

Trust is a critical factor in the success of any dispute resolution mechanism, as it influences the willingness of the parties to engage in the process and accept the outcome. The introduction of blockchain-based smart contracts in arbitration may impact the level of trust in the process, as it offers enhanced security, transparency, and immutability of information. This study seeks to explore the mediating role of trust in the relationship between the use of blockchain-based smart contracts and the speed of arbitration.

This study highlights the adoption of smart contracts to accelerate the arbitration process, as well as how the trust in the arbitration process contribute to this acceleration. Moreover, the study intends to provide valuable insights into the potential benefits and challenges associated with implementing blockchain-based smart contracts in the

arbitration process, ultimately helping to inform policymakers, legal practitioners, and stakeholders on the best practices for their adoption and use.

2. Literature Review and Theoretical Framework

2.1. Blockchain-based Smart Contracts

Blockchain technology, often referred to as a decentralized ledger, is a distributed and secure database that enables the storage and management of digital transactions without the need for a central authority. Smart contracts are self-executing agreements embedded within the blockchain, which automatically execute predefined terms and conditions when specific conditions are met. These contracts provide a transparent, tamper-proof, and efficient way to manage agreements between parties, reducing the need for intermediaries and minimizing transaction costs [1].

In the context of arbitration, blockchain-based smart contracts have the potential to streamline various aspects of the dispute resolution process, such as the exchange of evidence, submission of claims and counterclaims, and the calculation and distribution of monetary awards [2]. Additionally, the transparent and immutable nature of the blockchain ensures the integrity of the process, preventing tampering or alteration of data and potentially enhancing trust among parties [3].

2.2. Arbitration Speed

Arbitration speed refers to the efficiency and timeliness of the dispute resolution process, from the initiation of the arbitration proceedings to the final award. Speed is a crucial factor in arbitration, as parties typically seek an expeditious resolution to disputes to minimize costs and avoid prolonged uncertainty [4]. Various factors can influence the speed of arbitration, including the complexity of the dispute, the availability of the arbitrators, the procedural rules governing the arbitration, and the level of cooperation between the parties [5].

The use of blockchain-based smart contracts in arbitration may positively impact the speed of the process by automating certain aspects, reducing administrative burdens, and ensuring a transparent and secure exchange of information [6], [7]. However, the impact of smart contracts on arbitration speed has not been extensively explored in the literature, indicating a need for further research in this area [8].

2.3. Trust in the Arbitration Process

Trust is an essential component of any dispute resolution mechanism, as it affects the willingness of the parties to engage in the process and accept the final outcome [9]. In the context of arbitration, trust may be influenced by various factors, such as the perceived competence and impartiality of the arbitrators, the fairness of the arbitration rules, and the integrity and security of the process [10].

Blockchain technology has been suggested to enhance trust in various domains, including dispute resolution, due to its decentralized, transparent, and immutable nature [11]. By incorporating smart contracts into the arbitration process, parties may perceive an increased level of trust, as the technology ensures the execution of the agreement according to predefined terms and reduces the potential for human error or manipulation [12].

2.4 Impact of Blockchain-based Smart Contracts on Arbitration Speed

Blockchain-based smart contracts have the potential to significantly affect the arbitration process by increasing its speed and efficiency [13]. According to Swan (2015), smart contracts can automate various aspects of the arbitration process, such as enforcement, execution, and settlement, reducing the time and resources required to resolve disputes [14], [15]. Additionally, smart contracts can streamline the management of evidence and documentation, making it easier for arbitrators to access and review relevant materials. Overall, the literature suggests that the use of blockchain-based smart contracts could lead to faster and more efficient arbitration processes [16].

2.5 Impact of Blockchain-based Smart Contracts on Arbitration Trust

Trust is a crucial factor in the success of arbitration, as parties are more likely to engage in and accept the outcomes of a process they trust. Blockchain-based smart contracts may contribute to building trust in the arbitration process, given their inherent transparency, immutability, and security features [11]. By providing a tamper-proof and verifiable record of transactions, blockchain technology can enhance the credibility of the arbitration process, leading to increased trust among the involved parties [17], [18]. Thus, the literature indicates a positive relationship between the use of blockchain-based smart contracts and trust in the arbitration process [19].

2.6 Impact of Trust on Arbitration Speed

Trust in the arbitration process can have a significant impact on its speed and effectiveness. When parties trust the process, they are more likely to cooperate and engage constructively, leading to faster resolution of disputes [20]. High levels of trust can also reduce the need for extensive procedural safeguards, further streamlining the arbitration process [21]. In summary, the literature supports the notion that trust in the arbitration process can lead to increased speed and efficiency.

2.7 Indirect Impact of Blockchain-based Smart Contracts on Arbitration Speed through Mediating of Arbitration Trust

The literature reviewed in the previous sections suggests that blockchain-based smart contracts can positively impact both arbitration speed and trust, while trust can, in turn, influence the speed of the arbitration process [22]. This implies that there may be an indirect relationship between the use of blockchain-based smart contracts and arbitration speed, mediated by trust in the arbitration process. Although this indirect relationship has not been extensively studied in the literature, the existing evidence supports the plausibility of such a relationship. By increasing trust in the arbitration process, blockchain-based smart contracts could indirectly contribute to faster and more efficient dispute resolution [23], [24].

In conclusion, the literature review highlights the potential for blockchain-based smart contracts to enhance the arbitration process, particularly in terms of speed and trust [4], [25], [26]. Furthermore, it suggests that trust may play a mediating role in the relationship between the use of smart contracts and arbitration speed, indicating the need for further empirical research to explore these relationships in greater detail [27].

The theoretical framework for this study is based on the assumption that the use of blockchain-based smart contracts in arbitration can positively influence the speed of the process, with trust in the arbitration process acting as a mediating variable. This framework is grounded in the literature on smart contracts, arbitration speed, and trust, as well as the broader literature on the potential benefits of blockchain technology in various domains [28].

The proposed model suggests that the adoption of smart contracts may directly improve the speed of the arbitration process (H1) and enhance trust in the process (H2). In turn, increased trust in the arbitration process may further contribute to the acceleration of the process (H3). Finally, the model posits that trust in the arbitration process mediates the relationship between the use of smart contracts and the arbitration speed (H4).

3. Problem Statement and Research Gap

Despite the growing body of literature on the potential benefits of blockchain-based smart contracts in various industries, there is a notable scarcity of research specifically addressing their impact on the arbitration process. The existing studies have primarily focused on the technical aspects of smart contracts and their general implications for dispute resolution, without thoroughly examining the relationships between smart contracts, arbitration speed, and trust in the arbitration process.

The problem statement for the research study "The Influence of Blockchain-based Smart Contracts on Arbitration Speed: The Mediating Role of Trust in the Arbitration Process" is as follows: The current literature lacks empirical evidence on the direct and indirect impacts of blockchain-based smart contracts on the speed of arbitration, and the role trust in the arbitration process plays as a mediating variable.

This research gap is significant because understanding the relationships between smart contracts, arbitration speed, and trust can provide valuable insights for policymakers, legal practitioners, and stakeholders in the arbitration process. By addressing this gap, the study aims to contribute to the development of best practices for the use of smart contracts in arbitration, ultimately leading to more efficient and trustworthy dispute resolution processes.

To address this research gap, the study will investigate the following questions:

-How do blockchain-based smart contracts influence the speed of the arbitration process?

-How does trust in the arbitration process mediate the relationship between the use of smart contracts and the arbitration speed?

By exploring these questions, the research study will contribute to the literature on blockchain-based smart contracts and arbitration, offering new insights into the potential of this technology to enhance the efficiency and trustworthiness of dispute resolution processes.

3.1. Research Hypotheses

H1: The use of blockchain-based smart contracts positively influences the speed of the arbitration process.

H2: The use of blockchain-based smart contracts positively influences trust in the arbitration process.

H3: Trust in the arbitration process positively influences the speed of the arbitration process.

H4: Trust in the arbitration process mediates the relationship between the use of smart contracts and the arbitration speed.

3.2. Research Model

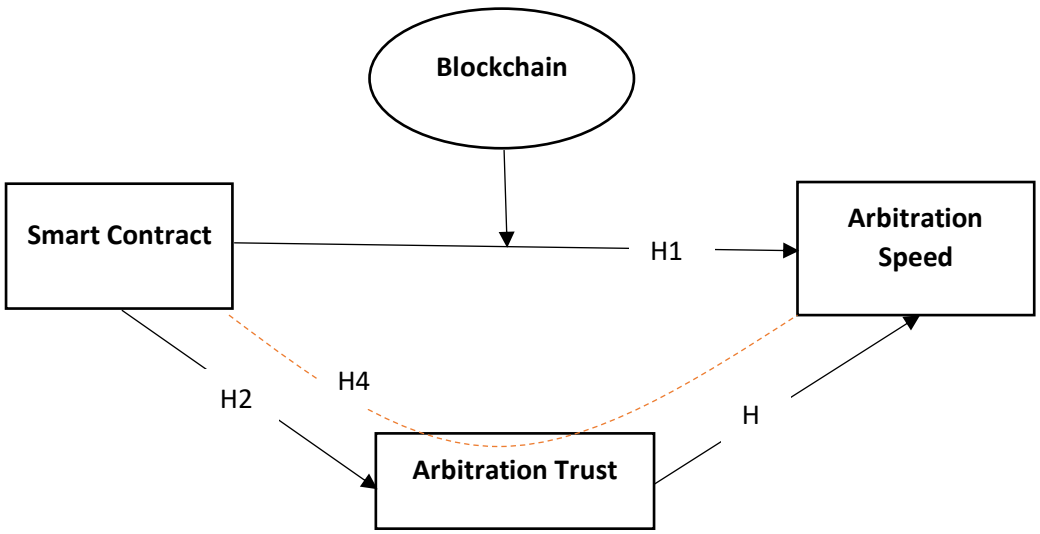

Figure 1: Conceptual Research Model (prepared by authors)

4. Methodology & Research Design

This study utilizes a quantitative research approach to systematically investigate the causal relationships between the variables of interest, specifically focusing on the influence of blockchain-based smart contracts on arbitration speed and trust. By adopting a descriptive and analytical design, the research aims to provide valuable insights into the associations between the variables in the context of the arbitration process. The empirical nature of the study ensures the collection and analysis of observable data to support the research findings. The deductive

approach allows the examination of relationships based on theoretical assumptions derived from the existing literature, while testing the hypotheses generated from the reviewed theories. This combination of empirical and deductive methods, along with the descriptive and analytical design, facilitates a comprehensive understanding of the impact of blockchain-based smart contracts on arbitration speed and the mediating role of trust in the arbitration process.

4.1. Population and Sample

The target population for this study includes arbitrators, legal practitioners, and parties involved in arbitration cases in which blockchain-based smart contracts were used. A purposive sampling technique has been employed to select participants who have had direct experience with such cases. A total of 800 participants were emailed, and 202 valid questionnaires were used to ensure adequate statistical power for the analyses.

4.2. Data Collection

An online survey was used to collect data from the participants. The survey includes questions designed to capture participants' demographic information, their experience with blockchain-based smart contracts, the speed of arbitration in their cases, and their perception of trust in the arbitration process.

4.3. Variables and Measurement

A structured questionnaire on a five-point Likert scale was developed to measure the study variables. Blockchain-based smart contracts in arbitration were measured through eight items, asking participants about their experience with smart contracts in their arbitration cases. The speed of arbitration was measured through seven items, asking participants about the total time taken to complete the arbitration process from the initiation of the case to the final decision. Trust in the arbitration process was measured through six items, asking participants to rate their trust in the arbitration process.

5. Data Analysis

Data Analysis Structural equation modeling (SEM) was employed to analyze the collected data and test the proposed hypotheses. SEM allows for the examination of the relationships between the variables while accounting for measurement errors and other potential confounders.

5.1 Evaluation of the measurement model

Using cross loadings of the indicators, average extracted variance (AVE), Cronbach's alpha, and composite reliability indices (CR), respectively, we evaluated internal consistency reliability, convergent validity, and discriminant validity (see table 1). The cut-off values recommended in the literature [29] were all met by these criteria. Reflective indicators were used to model the validated factors, and partial least squares (PLS) was used to assess the structural equation model. In addition to internal consistency, the measurement model's convergent and discriminant validity were assessed (see table 2).

5.2. Convergent Validity

The indicators must also be evaluated by having their calculation performed using a method that is frequently used in this analysis, such as Average Variance Extracted (AVE), Composite Reliability (CR), and Cronbach's Alpha. On the other hand, this method permits the study to offer some crucial procedures that must be addressed and examined to determine whether these indicators are reliable. Reliability also relates to crucial elements of the examination of the study model and its validity, which is sometimes referred to as internal consistency. The findings are shown in Table 1. For instance, convergent validity was calculated using AVE and CR, and the results showed excellent results from the measurement model. According to the results, the convergent validity should fall within the acceptable ranges of >0.50 and >0.60, respectively [30]. However, the outcomes of the measurement model for this study also largely confirmed all hypotheses and stated the validity as well as reliability

of the constructs. The study accepted all indicators because, for the most part, they met great factor loadings (>0.70) during the measurement model's first initial run, which could have had an impact on the outcomes.

Table 1: Composite Reliability, Average Variance Extracted, Cronbach's Alpha

Variables	CR (rho c)	AVE	Cronbach's Alpha
Blockchain Based Smart Contracts	0.964	0.718	0.955
Arbitration Speed	0.939	0.793	0.912
Arbitration Trust	0.944	0.772	0.925

5.3. Discriminant Validity

The results of this analysis, such as those from Fornell-Larcker and Heterotrait-Monotrait (HTMT), shown in Table 2, illustrate the variable correlations. The obtained results were computed using the AVE's square root, and most often they were displayed in a bold off-diagonal cell and showed higher correlations than the constructs themselves. As a result, the measurement model claimed that the discriminant validity had good findings. In addition, the current study has included another crucial analysis technique to evaluate the discriminant validity utilizing the HTMT approach. The findings, which were displayed in Table 2, demonstrated that the HTMT satisfied a good threshold of ≤ (0.90). Therefore, the key analysis of the discriminant validity of HTMT 0.90 is acceptable.

Table 2: Discriminant Validity

	HTMT			
	Construct	1	2	3
1	Blockchain Based Smart Contracts			
2	Arbitration Speed	0.754		
3	Arbitration Trust	0.635	0.602	
	Fornell-Lacker Criterion			
		1	2	3
1	Blockchain Based Smart Contracts	**0.847**		
2	Arbitration Speed	0.624	**0.890**	
3	Arbitration Trust	0.587	0.687	**0.878**

The PLS algorithm was used to generate the path coefficients, and the PLS boot- strapping procedure with a resampling of 5000 was used to calculate their significant level (0.05). The explanatory power of exogenous variables on endogenous variables was first verified using the chi-square value {R^2). This led to the model being able to explain 82.8% of the variation for arbitration trust and 87.7% of the variance for arbitration speed.

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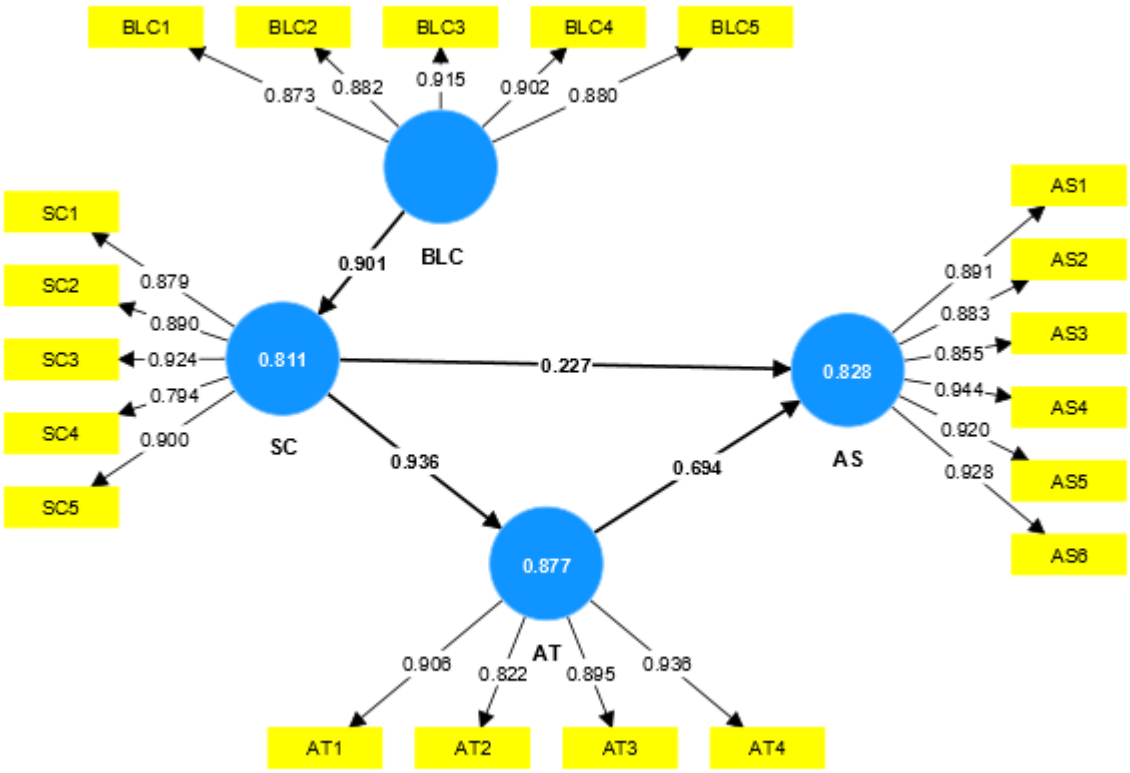

Figure 2: Structured Measurement Model (PLS-SEM)

According to Table 3, blockchain based smart contracts positively impacts the arbitration speed (BBSC>AS = 0.694, t = 2.65, p 0.008), supporting H1. Blockchain based smart contracts also improves the arbitration trust evidenced statistically (BBSC>AT =0.901, t =21.82, p=0.000) supporting the H2. Additionally, the influence of arbitration trust was measured on arbitration speed depicted as significant (AT>AS = 0.936, t= 2.81, p=0.000) supporting the H3. The mediating impact of arbitration trust on the connection between blockchain based smart contract and arbitration speed was investigated. Examining the indirect effect's (a + b) significance was the first step. There is mediation if the indirect effect is significant. As shown in Table 3, both the direct and indirect effects of blockchain based smart contracts on arbitration speed with mediation of arbitration trust were significant (BBSC>AT>AS = 0.585, t = 2.70, p = 0.007). As a result, the study model's arbitration trust experiences partial mediation (complementary mediation). Thereby, supporting H4.

Table 3: Hypothesis Testing

		Direct Effect				Indirect Effect				
Hypothesis	**Paths**	Beta	R^2	t-value	p-value	Beta	t-value	p-value	Percentile bootstrap 97.5% confidence interval	Decision
H1	BBSC→AS	0.694	0.828	2.65	0.008				Lower	Upper	Supported
H2	BBSC→AT	0.901	0.877	21.82	0.000				2.5%	97.5%	Supported
H3	AT→AS	0.936	0.811	2.81	0.000						Supported

H4	BBSC→AT →AS	0.627	30.28	0.000	0.585	2.70	0.007	-0.212	0.930	Partial Med

6. Discussion of Results

This research sheds the light on the speed of arbitration may be revolutionized by blockchain-based smart contracts that refers to supports to our first hypothesis. Similarly, self-executing programs known as smart contracts run on the blockchain network. Without the use of middlemen, they can automate contract execution and enforce the terms of the agreement. Due to automation, disputes can be resolved more quickly and effectively. The research finding ensures that all parties have access to the same information, reducing the risk of disputes arising from miscommunication or misinterpretation of the terms of the agreement. The findings also incorporate the transparency and trustworthiness of the blockchain can also help to expedite the resolution of disputes, as parties can quickly and easily refer to the terms of the contract. Additionally, blockchain-based smart contracts can be used to create tamper-proof and transparent records of all transactions.

We obtained evidence that the speed of arbitration may be dramatically impacted by blockchain-based smart contracts. They can streamline the dispute resolution process and lessen the need for middlemen by automating contract execution and producing clear, tamper-proof documents. The dependability of the underlying code and the restrictions of smart contracts for more intricate agreements are potential negatives to take into account. Overall, a number of variables, such as the unique context and the calibre of the underlying technology, will affect how blockchain-based smart contracts affect the speed of arbitration.

In contrast with the prior studies our findings propose by expediting the arbitration process and eliminating the need for middlemen, blockchain-based smart contracts have the potential to drastically alter the speed of arbitration. Smart contracts are self-executing computer programs that automatically enforce an agreement's terms, making them the perfect instrument for resolving disputes without the use of expensive middlemen or protracted court actions.

7. Conclusion

The results of this study will contribute to the understanding of how blockchain-based smart contracts can enhance the speed of arbitration processes and the role of trust in this relationship. This research can inform policymakers, legal practitioners, and stakeholders in the arbitration process, as well as potentially lead to the development of best practices for the use of smart contracts in arbitration. In addition, the use of blockchain-based smart contracts has the potential to significantly increase the speed and efficiency of arbitration. By using a decentralized system, the need for intermediaries can be reduced, which can decrease the time and cost associated with traditional arbitration processes. Additionally, the role of arbitration trust can help facilitate the adoption of blockchain-based smart contracts in arbitration by providing a neutral third party to oversee the process and ensure fairness. As the use of blockchain technology continues to grow, it is likely that it will become an increasingly popular tool in the field of arbitration.

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