

Evaluating Trust in Blockchain Technology for Waqf Adoption: Insights from Importance-Performance Map Analysis

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Abstract: Blockchain technology offers transformative benefits for waqf by enhancing transparency, security, and efficiency. Its decentralized ledger system allows for independent transaction verification, reduces central authority risks, and improves accountability. However, while the potential benefits are significant, the success of blockchain-based waqf initiatives hinges on the level of trust that stakeholders place in this technology. Therefore, the study aims to examine the effect of trust in blockchain technology on the intention to adopt waqf blockchain with insight from importance-performance map analysis to better understand the relations between trust and intention. The study adopted a survey research design and data was collected through questionnaires distributed throughout Malaysia. The collected data were then analyzed using Smart-PLS software. The results of the analysis indicate a strong positive relationship between trust in blockchain technology and the intention to adopt waqf blockchain. However, the importance-performance map analysis shows a critical disparity exists between user expectations and actual performance, especially regarding the transaction process, which scored the lowest in performance. This implies a need to focus on improving the transaction process to align with user expectations.

Keywords: *Trust, Blockchain, Intention, Waqf*

1. Introduction and Background

With the rapid advancement of financial technologies, blockchain presents a transformative opportunity for waqf, offering enhanced transparency, security, and efficiency in increasing public trust (Mohsin & Muneeza, 2019). Originating with Bitcoin in 2008, blockchain technology provides a decentralized ledger that allows all participants to independently verify transactions without the need for intermediaries (Yli-Huumo et al., 2016). This decentralization reduces risks associated with central authority manipulation and improves efficiency by eliminating bottlenecks inherent in traditional financial systems. The transparency of blockchain ensures that every transaction is visible and traceable to all network participants, fostering greater accountability and trust in the management of waqf funds. Additionally, the immutable nature of blockchain records prevents tampering and fraud, addressing major concerns related to fund integrity.

Blockchain also enhances data security and privacy, with encrypted, distributed data across multiple nodes making the system resistant to cyberattacks and unauthorized access. The technology supports user anonymity while maintaining transparency, which balances privacy with accountability (Marsal-Llacuna, 2018). By ensuring equal treatment of all network participants, blockchain aligns with the egalitarian principles of waqf, promoting fairness and inclusivity. Leveraging blockchain can therefore modernize waqf practices, improving fund collection and management while building greater public trust and efficiency in philanthropic efforts.

2. Literature Review

Several studies have underscored the transformative potential of blockchain technology for enhancing waqf management and accessibility. Mohamed and Lahsasna (2020) and Suryaningsih et al., (2020) both supported blockchain-based waqf systems that offer notable advantages, including improved transparency, secure record-keeping, and streamlined transactions between donors and administrators. Habib and Ahmad (2020) and Alharthi (2021) added the integration of smart contracts on blockchain platforms has the potential to further enhance the efficiency and operational performance of waqf institutions by automating processes and ensuring that the terms of waqf agreements are adhered to consistently. This capability has the potential to

rejuvenate the waqf system and restore its historical importance within Islamic social finance, thereby reinforcing its role in contemporary financial practices (Huda & Santoso, 2022). By modernizing waqf management through blockchain, technology could play a pivotal role in revitalizing this essential institution and making it more relevant in the digital age.

A practical application of blockchain-based waqf crowdfunding for fishermen groups in Surabaya has demonstrated its effectiveness in fostering trust and facilitating investments, as outlined by Sukmana (2020). By leveraging blockchain technology, waqf institutions can overcome traditional hindrances, such as the lack of transparency, inefficiencies, and mistrust, which have often plagued conventional waqf systems. Blockchain's decentralized and immutable ledger allows for greater transparency, enabling both donors and beneficiaries to track the flow of funds in real time. This transparency, coupled with the efficiency of automated smart contracts, streamlines the entire process, making it more accessible and trustworthy for all parties involved, as highlighted by Mohamed and Lahsasna (2020) and Huda & Santoso (2022).

However, while the potential benefits are significant, the success of blockchain-based waqf initiatives hinges on the level of trust that stakeholders place in this technology. It is supported by the study conducted by Fauzi et al., (2019) in the case of online cash waqf donation, consumers of internet banking use trust in online banking services as a deciding element before completing an online transaction. This finding underscores the importance of trust in the transaction medium, particularly in the context of online platforms. Mohd Thas Thaker et al. (2018), in their research on the behavioral intentions of crowd-funders to adopt the crowdfunding-waqf model (CWM), emphasized the need for waqf institutions and relevant authorities to foster trust in Web-based CWM platforms. A higher level of trust is crucial as it encourages individuals to engage more willingly in online interactions and transactions, fostering a greater sense of e-loyalty (Bart et al., 2005). Therefore, the study will investigate the relationship between trust in blockchain technology on intention to adopt waqf blockchain from the insights of importance-performance map analysis. By studying the importance-performance map analysis of trust in blockchain systems, waqf institutions can better design and implement blockchain-based solutions that not only meet technical requirements but also address the psychological and social dimensions of trust. This will ensure that the technology fulfills its promise of creating a more effective, transparent, and reliable waqf system.

3. Research Methodology

The study utilizes a survey research design to collect data. This approach allows the researchers to gain a wide range of insights from a diverse sample of individuals, which helps in analyzing the relationships and patterns between trust in blockchain technology and the intention to donate to cash waqf. The study focuses on individuals who have previously made several cash waqf contributions in Malaysia, with each individual serving as the unit of analysis. Due to practical considerations like the absence of a definitive population list, along with cost and time limitations, non-probability sampling techniques were employed. Specifically, the study used a convenience sampling method, where participants were selected based on their availability and proximity. In this method, the researcher also asked initial participants to refer to other potential participants who met the study's criteria. Data was gathered through questionnaires distributed across Malaysia, which included demographic questions and Likert-scale items designed to measure trust and intention, adapted from prior research (see Table 1). The gathered data was then analyzed using Smart-PLS software.

Table 1: Measurement Item

Construct	No. of Items	Source
Trust	4	Adapted from Alaeddin & Altounjy (2018)
Intention	4	Adapted from Kasri & Yuniar (2021) and Baber (2021)

4. Results and Discussion

Profile of Respondents

A total of 140 participants took part in the survey. The collected data was then input into IBM SPSS Statistics (Version 22) for screening and analysis. Of the respondents, 52.9 percent were male, and 47.1 percent were

female. The largest age group among the respondents was between 30 to 34 years old, comprising 40.0 percent of the sample, followed by those aged 20 to 24 years (15.7%), 25 to 29 years (14.3%), 35 to 39 years (12.1%), 40 to 44 years (7.9%), 50 to 54 years (7.9%), and 45 to 49 years (2.1%). Most respondents were from Pahang (25.7%), followed by Selangor (20.0%) and Terengganu (12.9%). Overall, the study successfully obtained participants from 12 states in Malaysia.

Regarding educational background, a significant portion of respondents held a bachelor's degree (40.0%), followed by those with a master's degree (25.7%), a doctoral degree (22.1%), and STPM/college diploma (10.7%), with only 1.4% having SPM or lower qualifications. In terms of income, most respondents earned less than RM1000 (29.3%), while others reported incomes of RM5001 and above (23.6%), RM3001-RM4000 (16.4%), RM1001-RM2000 (14.3%), RM4001-RM5000 (13.6%), and RM2001-RM3000 (2.9%).

As for their experience with giving cash waqf, 29.3 percent of respondents had done so a few times, 26.4 percent gave once a year, 18.6 percent contributed once a month, 17.9 percent donated once every two to three months, 5.7 percent made weekly contributions, and 2.1 percent gave daily. The most preferred method for making cash waqf contributions was online payment (48.6%), followed by giving directly to an individual collecting cash waqf (25.0%). Additionally, 18.6 percent of respondents preferred to go to a counter, and 7.9 percent opted for salary deductions.

Reliability and validity

To the requirements for PLS-SEM analysis, we first assessed the measurement model before moving on to the structural model evaluation. To evaluate the measurement model, we examined internal consistency reliability, discriminant validity, and convergent validity.

Internal Consistency Reliability

Table 2: Internal Consistency Reliability

Construct	Items	Loadings	Cronbach's Alpha	Rho_A	CR	AVE	R Square
Trust	TRUST1	0.845	0.854	0.863	0.901	0.695	-
	TRUST2	0.868					
	TRUST3	0.781					
	TRUST4	0.839					
Intention	INT1	0.901	0.900	0.912	0.930	0.768	0.63
	INT2	0.908					
	INT3	0.843					
	INT4	0.853					

When the Cronbach's Alpha value of each construct exceeds 0.7 (Nunnally & Bernstein, 1979) the rho_A coefficient value of each construct exceeds 0.7 (Dijkstra & Henseler, 2015), and the composite reliability (CR) of each construct exceeds the threshold value of 0.7, a measurement model has satisfactory internal consistency reliability (Hennington et al., 2009). The Cronbach's Alpha, rho_A, and CR of each construct in this investigation are all above the required threshold value, as shown in Table 2. Consequently, the findings suggest that the items used to represent the constructs are internally consistent and reliable.

Table 3 shows that all items exhibited loadings in the range of 0.70 to 0.95 on the construct they were measured. Whilst no items loaded higher on constructs they were not intended to measure. These results confirmed the convergent validity of the constructs.

Table 3: Factor Loading and Cross Loading

	Intention	Trust
INT1	0.901	0.761
INT2	0.908	0.774
INT3	0.843	0.607
INT4	0.853	0.613
TRUST1	0.693	0.845
TRUST2	0.726	0.868
TRUST3	0.544	0.781
TRUST4	0.665	0.838

The structural model

We performed bootstrapping which involved 500 samples whilst our actual sample stood at 140. The SEM result is presented in Table 5. It can be observed in Table 2 that the R² value is 0.63 suggesting that 63 percent of the variance in intention is explained by the trust construct. Table 4 shows the beta path coefficients (β 0.794) were positive and in the expected direction with intention and were statistically significant at (p<0.01).

Table 4: Path Coefficient and hypothesis testing

Hypothesis	Causal Path	Std Beta	Std Error	t-value	Supported
H1	TRUST – INT	0.794	0.029	27.655**	Yes

Note: *p<0.05; **p<0.01

The positive and significant relationship between trust and intention aligns with the findings of Zakariyah et al. (2023), which demonstrate that perceived trust plays a crucial role in influencing the adoption of financial technology (fintech) solutions by Malaysian waqf institutions. In their study, Zakariyah et al. highlighted that trust is a key determinant in the decision-making process of stakeholders when it comes to embracing new technology platforms for managing waqf funds. This is because fintech platforms, much like blockchain-based systems, rely heavily on user confidence in the security, transparency, and reliability of the technology. When stakeholders perceive a high level of trust in the technology, they are more likely to engage with it, seeing it as a secure and efficient means to facilitate waqf contributions and management. This trust not only encourages the adoption of these platforms but also strengthens the overall intention to participate in waqf activities, thereby enhancing the effectiveness and reach of waqf institutions.

Importance-Performance Map Analysis (IPMA)

To complement the PLS-SEM analysis, an importance-performance map analysis (IPMA) was carried out to analyze the importance and performance of each dimension of trust against intention. Through IPMA, low-performing but important items can be identified for improvement purposes. The standardized total effects (importance) and the standardized latent variable scores (performance) are shown in Table 5 and Figure 2 below:

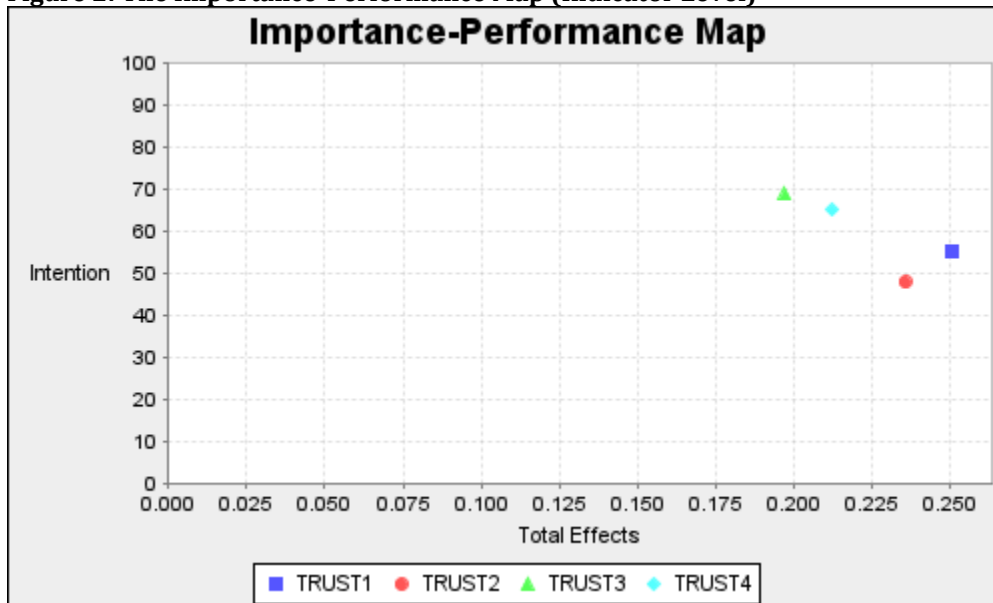
Table 5: Importance and performance of IPMA

Items	Total effects (importance)	Standardized latent variable scores (performance)
I have confidence in the service provided by the blockchain platform	0.250	55.0000
I believe the transaction process of the blockchain platform is correct	0.262	47.8570
I believe the transaction results of the blockchain platform are correct	0.197	68.8100
I believe the transaction system of the blockchain platform is secure	0.240	65.0000

In terms of importance, is the belief that the transaction process is correct, scoring 0.262. This indicates that users place a high value on the accuracy and reliability of the steps involved in a transaction. The following closely is confidence in the service, with a score of 0.250, reflecting the importance of trust in the service provider. Security also ranks highly, with a score of 0.240, showing that users prioritize the safety of their transactions. Lastly, the belief that the transaction result is correct has an importance score of 0.197, indicating that while still significant, it is slightly less emphasized compared to the process, service, and security.

In terms of performance, the belief that the transaction result is correct scores the highest at 68.810, suggesting that users are generally satisfied with the accuracy of the outcomes. The belief in the security of transactions also performs well, scoring 65.000, which reflects user confidence in the safety measures in place. However, confidence in the service, with a performance score of 55.000, indicates that there is room for improvement in how the service is perceived. The transaction process, despite being the most important factor, has the lowest performance score at 47.857, highlighting a significant gap between user expectations and their experience.

Figure 2: The Importance-Performance Map (Indicator Level)



The analysis reveals that while users place the highest importance on the accuracy and reliability of the transaction process, this aspect has the lowest performance score, indicating a significant gap between expectations and actual experiences. Users highly value security and the correctness of the transaction process and outcome, but the process itself needs improvement to meet their standards.

Confidence in the service is also critical, ranking second in importance, but its performance score suggests there is room for improvement in how the service provider is perceived. While the transaction outcomes are generally satisfactory, with the highest performance score, the lower scores in the transaction process and service confidence indicate areas where enhancements are needed to align performance with user expectations. The findings suggest that to improve overall user satisfaction, efforts should focus on enhancing the transaction process and building greater confidence in the service provider.

5. Managerial Implications and Recommendations

The findings indicate that users prioritize the accuracy and reliability of the transaction process, yet this aspect has the lowest performance score, highlighting a significant gap between expectations and actual experiences. To address this, managers should focus on refining and optimizing the transaction process by implementing more robust verification systems, automating critical steps, and conducting regular audits to ensure consistency. Additionally, security remains a key concern for users, and enhancing security measures, such as using advanced encryption and multi-factor authentication, is essential. Regular security updates, transparency

about protocols, and quick responses to breaches will bolster user confidence in the platform's safety. Moreover, building confidence in the service provider is crucial, as its current performance score suggests room for improvement. Managers should enhance customer support, ensure transparency in operations, and actively engage with users to address their concerns. Clear communication and responsive support services will significantly improve user confidence and satisfaction. The positive link between trust and the intention to adopt fintech solutions further underscores the importance of cultivating trust in these platforms. Managers should emphasize the security, transparency, and reliability of their fintech solutions through educational campaigns that alleviate concerns and encourage adoption.

Conclusion

In conclusion, the study underscores a critical disparity between user expectations and the actual performance of the transaction process, highlighting a key area for improvement. While users place substantial value on the accuracy, reliability, and security of transactions, current performance in these areas falls short, with the process itself receiving notably lower scores compared to transaction outcomes and service confidence. To bridge this gap and enhance overall user satisfaction, service providers need to focus on refining the transaction process and bolstering user confidence in the service. Improving these aspects will not only align performance with user expectations but also foster greater trust in the service provider, as evidenced by the positive relationship between trust and intention to use fintech solutions. This is particularly relevant in contexts like the management of waqf funds, where trust in technology plays a pivotal role in adoption and engagement.

However, a limitation of the study is the potential bias introduced by convenience sampling, which may impact the generalizability of the findings. To address this limitation, future research should aim for a more representative sample by employing rigorous sampling methods, such as stratified or random sampling, to ensure a diverse and balanced representation of stakeholder views. This approach will provide a more comprehensive understanding of the factors influencing blockchain adoption in waqf systems and enhance the robustness of the study's conclusions.

In essence, prioritizing improvements in transaction accuracy, reliability, and user confidence will not only address current performance shortcomings but also drive greater user satisfaction and engagement.

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