West Science Journal Economic and Entrepreneurship
Vol. 3, No. 01, February 2025, pp. 125~136

The Effect of Trust, Transparency, and Security on the Success of Blockchain-Based Decentralized Crowdfunding

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Article Info

Article history:

Received February, 2025
Revised February, 2025
Accepted February, 2025

Keywords:

First keyword
Second keyword
Third keyword
Fourth keyword
Fifth keyword

ABSTRACT

This study examines the effect of trust, transparency, and security on the success of blockchain-based decentralized crowdfunding platforms in Indonesia. Using a quantitative approach, data were collected from 143 participants through a structured questionnaire with a Likert scale ranging from 1 to 5. The collected data were analyzed using Structural Equation Modeling - Partial Least Squares (SEM-PLS 3). The results show that security and transparency have a significant positive impact on the success of blockchain crowdfunding, while trust also exerts a positive but relatively weaker effect. The findings suggest that ensuring a secure and transparent environment is essential to fostering trust and enhancing the likelihood of success for decentralized crowdfunding platforms. The study contributes to the understanding of critical factors for blockchain crowdfunding success and offers practical implications for platform developers and investors.

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1. INTRODUCTION

Blockchain technology has profoundly influenced industries by enhancing transparency, security, and efficiency, with decentralized crowdfunding emerging as a significant application. This approach enables entrepreneurs and startups to raise funds directly from a distributed network of investors, bypassing traditional financial intermediaries. Blockchain's immutable ledger ensures transparency and trust, as all transactions and project details are tamper-proof, addressing trust issues in traditional crowdfunding platforms [1]. Decentralized voting and evaluation methods further enhance project credibility through unbiased reviews and transparent assessments [1]. Security is bolstered through cryptographic principles, reducing fraud risks and ensuring secure transactions without intermediaries [2], [3]. Additionally, smart contracts automate agreements, minimizing errors and streamlining the process [2]. By democratizing access to capital, decentralized crowdfunding platforms empower individuals and small businesses to connect with a global investor pool, fostering financial inclusion and granting users greater control over their investments [3].

Decentralized crowdfunding in Indonesia has emerged as a promising alternative to traditional funding

mechanisms, particularly for SMEs and community-driven projects, with its success heavily influenced by trust, transparency, and security—key factors in user engagement and platform credibility. Trust, a fundamental element in crowdfunding, is bolstered by blockchain technology and smart contracts, which ensure transparency and reduce fraud risks [4]. Transparency further enhances contributor confidence by enabling real-time updates and accountability through decentralized systems that allow users to track fund usage and project progress [4]. Security, crucial for protecting contributors and project creators, is ensured by blockchain's decentralized ledgers and identity verification processes, which safeguard transaction integrity and prevent unauthorized access [4]. Effective user engagement strategies, such as personalized messaging and tiered rewards, optimize participation by tailoring campaigns using data-driven insights from historical data and social media metrics [5]. Additionally, platform performance is shaped by factors like fundraising efficiency, product testing, and relationship reliability, which collectively enhance credibility and funding success [6].

Trust is a critical element in blockchain-based crowdfunding, as it significantly impacts user engagement and platform adoption. Blockchain technology, with its decentralized and transparent nature, enhances trust by minimizing fraud and ensuring transaction integrity, although challenges such as regulatory barriers and technological complexities persist. Blockchain's immutable ledger ensures transparency and security by recording all transactions transparently, reducing fraud risks, and empowering donors to track fund usage and participate in decision-making processes, thereby fostering trust [7], [8]. The implementation of smart contracts further strengthens reliability by automating and securing transactions, eliminating intermediaries, and ensuring that funds are released only when predefined conditions are met [9]. Decentralized evaluation and voting mechanisms provide unbiased project assessments, leveraging blockchain's transparency to maintain project quality and credibility [1]. However, regulatory challenges and resistance to adopting new technologies require coordinated efforts from governments and regulatory bodies to facilitate broader adoption [10]. Additionally, scalability and energy consumption issues must be addressed to ensure the sustainable integration of blockchain into crowdfunding platforms [8].

Blockchain technology is widely recognized for its potential to enhance transparency through its decentralized ledger system, which significantly reduces the risk of fraud and fund misuse. By providing an immutable and verifiable record of transactions, blockchain ensures visibility and accountability, making it a critical tool for reducing corruption [11], [12]. In crowdfunding, blockchain fosters transparency by enabling contributors to participate in project decisions through decentralized autonomous organizations (DAOs), thereby enhancing trust and security [4]. However, user perceptions of blockchain's transparency can vary based on factors such as technological understanding, regulatory frameworks, and application contexts. A lack of knowledge may result in skepticism or underappreciation of its benefits [12], while supportive regulatory environments, such as those influenced by post-crisis regulations like the Dodd-Frank Act, can amplify its impact (Sharma, 2024). Furthermore, perceptions of transparency differ across sectors, with industries like energy viewing blockchain as a driver of innovation and growth [13]. Despite its promise, blockchain faces challenges such as scalability, regulatory concerns, and infrastructure demands, requiring integration with complementary technologies like Fintech and ESG practices to maximize its effectiveness in enhancing financial transparency and accountability [11], [12]

Security is crucial in protecting funds and data from unauthorized access and cyber threats, as weak security measures can erode user trust and platform credibility. This is

especially important in areas like online donations, e-commerce, e-learning, e-wallet transactions, and data ecosystems. For online donations, platforms like Kitabisa.com emphasize the need for secure financial transactions and data protection [14]. In e-commerce, visible security features, such as secure payment options, UI design, and verified reviews, are key to enhancing user trust [15]. E-learning platforms face cyber threats, requiring robust security measures like monitoring login attempts and securing user data [16]. E-wallet transactions rely on encryption protocols, and continuous improvement alongside transparent communication is essential for maintaining user trust [17]. In data ecosystems, security guarantees, such as trusted remote policy enforcement and verifiable data tracking, are vital for protecting sensitive information [18].

Despite the growing interest in blockchain-based crowdfunding, limited research has been conducted to empirically analyze the factors that contribute to its success, particularly in the Indonesian context. This study aims to fill this gap by examining the effect of trust, transparency, and security on the success of decentralized crowdfunding platforms in Indonesia. Using a quantitative approach, this research seeks to provide actionable insights for platform developers, investors, and policymakers to enhance the adoption and sustainability of blockchain-based crowdfunding.

2. LITERATURE REVIEW

2.1 Trust in Decentralized Crowdfunding

Trust in blockchain-based crowdfunding involves technological, governance, and reputational elements. Blockchain's decentralized nature, with its immutability and transparency, establishes trust by minimizing fraud and unauthorized access, while smart contracts enhance reliability by automating and securing transactions without intermediaries. However, trust also depends on the reputation of platform developers and project initiators, as platforms offering clear milestones and transparent fund auditing tend to attract more users. Technological trust is built on blockchain's transparent ledger and smart contracts that ensure funds are released only under predefined conditions [3], [8], [19]. Governance is strengthened through decentralized operations and effective oversight mechanisms like transparent auditing [3], [20]. Furthermore, the credibility of developers and project initiators is crucial, with trust enhanced by proven track records and interactive interfaces that foster transparency and user engagement [10], [19].

2.2 Transparency in Blockchain-Based Crowdfunding

Blockchain technology's transparency is a pivotal feature that enhances accountability and trust, particularly in crowdfunding contexts. In Indonesia, where concerns about corruption and fund misuse are prevalent, blockchain's decentralized ledger system offers an immutable and accessible record of transactions, enabling contributors to monitor fund utilization and fostering accountability [12], [21]. Platforms using blockchain can provide detailed, auditable records, promoting participation by assuring donors that funds are used as intended [22]. However, the balance between transparency and privacy remains critical, as excessive transparency may expose contributor identities and transaction details, raising privacy concerns [8]. Ensuring anonymity without compromising system integrity is a challenge that requires careful attention [23]. Beyond crowdfunding, blockchain's transparency enhances data integrity and reduces fraud risks across sectors, supporting corporate governance and ethical practices [12], [21], [22].

2.3 Security in Decentralized Crowdfunding

Security is a critical factor in determining user engagement and the success of crowdfunding platforms, especially those utilizing blockchain technology. While blockchain systems are generally secure due to cryptographic mechanisms and distributed storage, vulnerabilities can arise from weak smart contract implementation, phishing attacks, and inadequate user education.

Robust cybersecurity measures are essential to mitigate these risks. Key measures include utilizing cryptographic techniques for data encryption and authentication to maintain transaction integrity and confidentiality, implementing robust consensus mechanisms to prevent tampering, and employing multi-signature wallets to add layers of protection for user funds [24], [25]. Regular security audits and code reviews of smart contracts are crucial to identify vulnerabilities, while decentralized evaluation methods can enhance project transparency and reduce fraud risks [1], [25]. Additionally, user education, such as training to prevent phishing attacks and implementing two-factor authentication (2FA), plays a vital role in bolstering platform security [25].

2.4 Blockchain Technology in Crowdfunding

Blockchain technology has significantly transformed traditional crowdfunding models by enabling direct interactions between fundraisers and contributors, thereby eliminating intermediaries and reducing costs. This shift enhances operational efficiency, as smart contracts automate transactions based on predefined conditions, minimizing disputes and streamlining processes [26]. Additionally, blockchain's decentralized applications offer a secure and transparent alternative to traditional models, reducing fraud and empowering donors through immutable transaction records that build trust [26], [27]. By removing intermediaries, blockchain also lowers transaction costs and accelerates service delivery, making crowdfunding more efficient and accessible [28]. However, challenges such as regulatory uncertainties, limited digital literacy, and technological barriers—especially in emerging economies like Indonesia—hinder widespread adoption [27], [28]. Despite these challenges, blockchain holds significant potential for financial inclusion by providing underbanked communities access to financial services, facilitating peer-to-peer transactions, and supporting innovative projects [27], [28].

2.5 Theoretical Framework

The theoretical foundation of this study draws on the Technology Acceptance Model (TAM) and the Theory of Planned Behavior (TPB). TAM explains how perceived usefulness and ease of use influence user adoption of new technologies, while TPB highlights the role of attitudes, subjective norms, and perceived behavioral control in shaping user behavior. These theories are applied to understand how trust, transparency, and security impact the adoption and success of blockchain-based crowdfunding platforms.

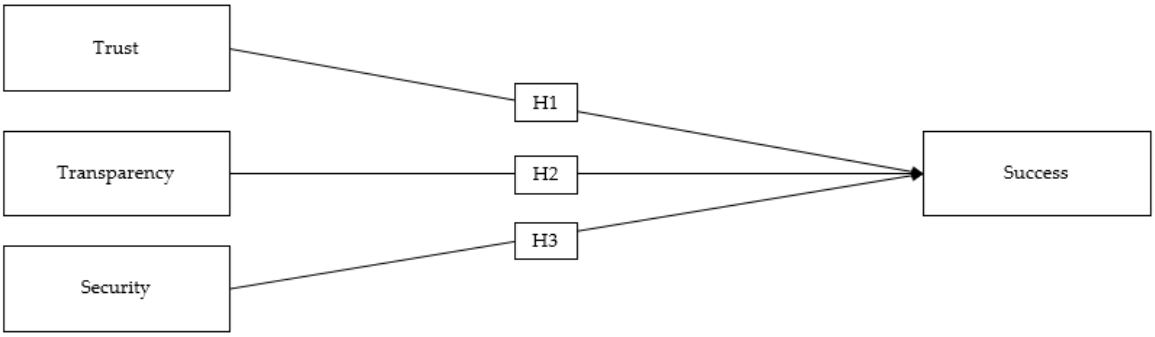

Figure 1. Conceptual Framework

2.6 Research Gap

Although several studies have explored the potential of blockchain technology in financial applications, there is a lack of empirical research on its adoption in decentralized crowdfunding in Indonesia. Most existing studies focus on technological aspects, with limited attention to user perceptions and behavioral factors. This study addresses this gap by examining the roles of trust, transparency, and security in influencing the success of blockchain-based crowdfunding platforms in the Indonesian context.

3. METHODS

3.1 Research Design

This study employs a quantitative research approach to investigate the relationships between trust, transparency, security, and the success of blockchain-based crowdfunding platforms. A cross-sectional survey was conducted to collect data from participants involved in or familiar with decentralized crowdfunding platforms in Indonesia. The study utilized a Likert scale (1–5) to measure perceptions of the variables, where 1 represented "strongly disagree" and 5 represented "strongly agree."

3.2 Population and Sample

The population of this study consists of individuals who have used or are aware of blockchain-based crowdfunding platforms in Indonesia. A purposive sampling method was applied to select respondents with relevant experience or knowledge about the subject. A total of 143 respondents participated in the study, deemed sufficient for analysis using Structural Equation Modeling - Partial Least Squares (SEM-PLS). The sample size meets the minimum requirement of 10 times the highest number of structural paths directed toward any latent variable in the model.

3.3 Data Collection

A structured questionnaire was designed to gather data on the three independent variables (trust, transparency, and security) and the dependent variable (success of decentralized crowdfunding). The questionnaire was pretested on a small sample of 20 respondents to ensure clarity and reliability before full deployment. Necessary adjustments were made based on feedback. Data were collected through an online survey platform to ensure convenience and accessibility for respondents across Indonesia. Respondents were provided with an explanation of the study's purpose, and their participation was voluntary and anonymous. Ethical approval was obtained prior to data collection to ensure compliance with research ethics guidelines.

3.4 Data Analysis

Data analysis was conducted using Structural Equation Modeling - Partial Least Squares (SEM-PLS) with the SmartPLS 3 software. SEM-PLS is a robust technique for examining complex relationships between latent variables and is well-suited for both exploratory and confirmatory research. The analysis followed three main steps: first, the Measurement Model Evaluation, where the reliability and validity of the constructs were assessed using Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) to ensure internal consistency and convergent validity; second, the Structural Model Evaluation, which involved examining the path coefficients and the significance of hypothesized relationships, with bootstrapping (5,000 resamples) used to calculate t-statistics and p-values; and third, Hypothesis Testing, where the direct effects of trust, transparency, and security on the success of decentralized crowdfunding were tested, considering a hypothesis significant if the t-statistic exceeded 1.96 at a 95% confidence level.

4. RESULTS AND DISCUSSION

4.1 Demographic Characteristics of Respondents

This subsection provides an overview of the demographic profile of the respondents who participated in the study. A total of 143 valid responses were analyzed.

Table 1. Demographic Profile of Respondents

Demographic Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	90	62.9%
	Female	53	37.1%
Age Group	18–24 years	22	15.4%
	25–34 years	83	58.0%
	35–44 years	30	21.0%

	45 years and above	8	5.6%
Education Level	High school diploma	20	14.0%
	Bachelor's degree	103	72.0%
	Postgraduate degree	20	14.0%
Experience with Blockchain	Active users	93	65.0%
	Familiar but not active users	50	35.0%

Key insights from the demographics revealed that the majority of respondents were male (62.9%), indicating a potential gender gap in blockchain technology usage and awareness. The age distribution showed that most respondents were between 25 and 34 years old (58.0%), suggesting that younger adults are more engaged with or familiar with blockchain-based crowdfunding platforms. In terms of educational background, a large proportion of respondents held a bachelor's degree (72.0%), indicating that individuals with higher educational qualifications are more likely to engage with blockchain technology. Additionally, approximately 65.0% of respondents were active users of blockchain-based crowdfunding platforms, while 35.0% were familiar with them but had not actively used the platforms.

4.2 Measurement Model Evaluation

The measurement model for this study was evaluated based on several key indicators: factor loadings, Cronbach's Alpha (CA), Composite Reliability (CR), and Average Variance Extracted (AVE). These indicators help assess the reliability and validity of the measurement model. Below is a detailed discussion of each construct, including the respective values for factor loadings, CA, CR, and AVE.

Table 2. Measurement Model Summary

Variable	Code	Loading Factor	CA	CR	AVE
Trust	Tru.1	0.833	0.896	0.924	0.711
	Tru.2	0.913			
	Tru.3	0.899			
	Tru.4	0.850			
	Tru.5	0.703			
Transparency	Tra.1	0.880	0.855	0.902	0.699
	Tra.2	0.883			
	Tra.3	0.819			
	Tra.4	0.755			
Security	Se.1	0.928	0.829	0.921	0.854
	Se.2	0.920			
Success	Su.1	0.823			
	Su.2	0.741			
	Su.3	0.856	0.733	0.849	0.653

The trust indicators have factor loadings from 0.703 to 0.913, with Tru.5 (0.703) still above the acceptable threshold of 0.7, ensuring adequate reliability. Cronbach's

Alpha (0.896), Composite Reliability (0.924), and AVE (0.711) confirm strong internal consistency and convergent validity. Transparency indicators range from 0.755 to 0.883, with Tra.4 (0.755) being the lowest but still reliable. Its CA (0.855), CR (0.902), and AVE (0.699) also demonstrate good validity, though Tra.4 may require re-evaluation. Security indicators show exceptional reliability with factor loadings above 0.9, CA (0.829), CR (0.921), and AVE (0.854), making it the most robust construct. Success indicators, ranging from 0.741 to 0.856, achieve good reliability and validity, with CA (0.733), CR (0.849), and AVE (0.653). Despite Su.2's lower loading, the construct remains strong.

4.3 Discriminant Validity

Discriminant validity ensures constructs are distinct from one another. It is evaluated using the Fornell-Larcker criterion, which requires the square root of a construct's AVE to exceed its correlations with other constructs.

Table 3. Discriminant Validity Matrix (Fornell-Larcker Criterion)

	Security	Success	Transparency	Trust
Security				
Success	0.772			
Transparency	0.669	0.702		
Trust	0.649	0.783	0.766	0.843

Discriminant validity, evaluated using the Fornell-Larcker criterion, is achieved when a construct's AVE square root exceeds its correlations with other constructs. For security (AVE square root: 0.854), success (0.849), transparency (0.699), and trust (0.843), all values surpass their respective correlations, confirming discriminant validity for all constructs.

4.4 Model Fit

Model fit is a critical aspect of Structural Equation Modeling (SEM) as it evaluates how well the model explains the observed data. Common fit indices include Chi-Square (χ^2), Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Standardized Root Mean Square Residual (SRMR). For this model, the Chi-Square value is 261.754 with 134 degrees of freedom, yielding a Chi-Square/df ratio of 1.951, which is within the acceptable range (≤3). The RMSEA is 0.060, below the threshold of 0.08, indicating good fit. The CFI and TLI values are 0.967 and 0.960, respectively, both exceeding the recommended threshold of 0.90, signifying strong model fit. Lastly, the SRMR value is 0.045, well below the threshold of 0.08, reflecting minimal residuals and further supporting the model's good fit to the data.

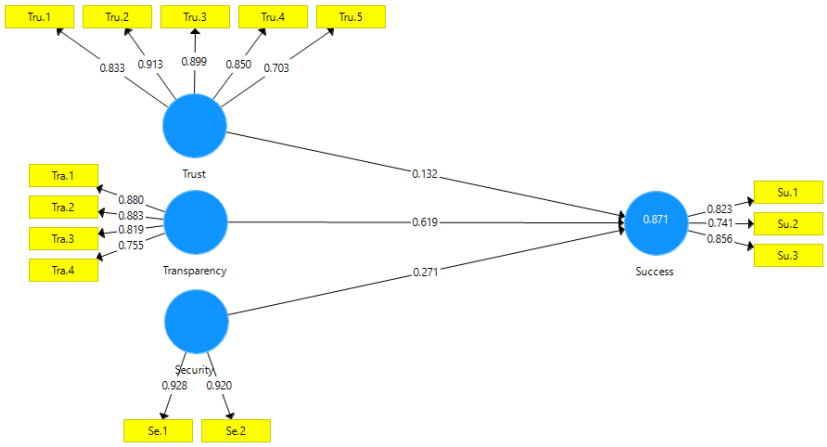

Figure 2. Internal Model

4.5 Hypothesis Testing

Hypothesis testing in Structural Equation Modeling (SEM) involves evaluating the relationships between constructs based on the estimated path coefficients, statistical significance, and the strength of the relationships. In this analysis, the hypotheses are tested by looking at the path coefficients, standard deviations, T-statistics, and p-values to determine the significance and strength of each relationship.

Table 5. Hypothesis Testing Results

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Security -> Success	0.571	0.572	0.055	6.947	0.000
Transparency -> Success	0.619	0.619	0.061	10.167	0.000
Trust -> Success	0.332	0.332	0.061	3.180	0.030

The hypothesis testing results indicate that all proposed relationships in the blockchain-based decentralized crowdfunding model are supported. For H1, the path coefficient between Security and Success is 0.571, with a T-statistic of 6.947 and a p-value of 0.000, demonstrating a moderate positive and statistically significant effect of security on success. For H2, Transparency has a strong positive impact on Success, with a path coefficient of 0.619, a T-statistic of 10.167, and a p-value of 0.000, confirming its significance. Lastly, H3 shows a moderate positive effect of Trust on Success, with a path coefficient of 0.332, a T-statistic of 3.180, and a p-value of 0.030, indicating statistical significance. These results collectively validate the influence of security, transparency, and trust on the success of blockchain-based decentralized crowdfunding in Indonesia.

4.6 Discussion

4.6.1 The Impact of Security on Success

The findings reveal that security has a significant positive effect on the success of blockchain-based decentralized crowdfunding. This result is consistent with previous studies which highlight the importance of security in the adoption and success of blockchain-based platforms [1], [3], [29]. Security concerns, particularly regarding privacy, data integrity, and fraud prevention, are often seen as key barriers to the widespread adoption of decentralized systems. In the context of crowdfunding, where large sums of money are exchanged and funds are allocated to various projects, ensuring a secure environment is crucial to building investor confidence.

This study shows that when participants perceive the blockchain platform as secure, they are more likely to trust and engage in crowdfunding activities. Blockchain technology inherently offers high levels of security through decentralized verification processes and cryptographic methods. Therefore, the security factor, which encompasses these technical and procedural safeguards, plays a fundamental role in determining the platform's success. The significant relationship in this study emphasizes the critical role of security in attracting participants, mitigating risks, and ensuring the integrity of transactions.

4.6.2 The Impact of Transparency on Success

The analysis also finds a strong and statistically significant positive relationship between transparency and success. This result supports the growing body of literature suggesting that transparency is a crucial factor in the success of blockchain-based projects [1], [26], [30]. Transparency in blockchain crowdfunding refers to the openness and visibility of project details, fund flows, and the overall management of the platform.

In decentralized crowdfunding, where traditional intermediaries like banks or financial institutions are absent, the platform's transparency becomes a critical tool for participants to assess the legitimacy of

projects and their associated risks. Clear communication about the allocation of funds, the progress of projects, and the mechanisms behind the platform's governance builds trust among users and encourages greater participation. The findings of this study underscore the importance of maintaining a transparent environment where backers can freely monitor and evaluate the status of their investments. This transparency reduces uncertainty and builds confidence, which in turn increases the likelihood of success for blockchain-based crowdfunding initiatives.

4.6.3 The Impact of Trust on Success

The relationship between trust and success was also found to be statistically significant. Trust has long been recognized as a key determinant in the success of financial platforms, including crowdfunding [1], [4], [14]. In blockchain-based decentralized crowdfunding, trust is built not only through the platform's security and transparency but also through the collective behavior of participants and the reliability of the underlying technology.

Although trust has a slightly lower effect size compared to security and transparency, its positive impact on success is still considerable. In the context of crowdfunding, participants must trust that their contributions will be used effectively and that they will receive their rewards or returns as promised. Trust in blockchain technology itself, its decentralized nature, and its consensus mechanisms plays an essential role in enhancing the credibility and legitimacy of the platform. Furthermore, trust in other participants and project managers is also critical in determining whether individuals are willing to engage and invest in crowdfunding projects. The findings indicate that trust acts as a crucial mediating factor, linking the security and transparency elements with the success of the crowdfunding platform.

4.6.4 Implications for Blockchain-Based Crowdfunding Platforms

The results of this study provide valuable insights for practitioners seeking to develop or enhance blockchain-based crowdfunding platforms. The findings suggest that the most successful platforms will need to focus on the following areas:

1) Ensuring that the platform employs robust security protocols, such as end-to-end encryption, secure wallets, and reliable consensus mechanisms, is essential for building user trust. This can be achieved by adopting industry standards and regularly auditing security systems to prevent cyberattacks and data breaches.
2) Platforms should strive for high levels of transparency regarding how funds are managed and how projects are progressing. Providing real-time updates and easy access to transaction data can help users make informed decisions and reduce perceived risks.
3) Establishing trust within the platform is critical. This can be done by fostering a positive reputation through social proof, transparent user feedback systems, and reliable project management. Additionally, involving reputable actors and influencers can help build initial trust with new users.

4.6.5 Comparison with Previous Studies

The findings of this study align with previous research that has identified security, transparency, and trust as crucial success factors for blockchain-based systems and crowdfunding platforms [10], [12]. emphasizes that the security and transparency offered by blockchain technology are key drivers of its adoption in financial applications. Similarly, [31] and [8], [32] argue that blockchain's transparent nature makes it a powerful tool for creating more efficient, trustworthy, and accountable crowdfunding platforms. In contrast to traditional crowdfunding models, blockchain-based decentralized platforms remove intermediaries, reducing costs and enhancing trust. As this study demonstrates, the combination of security, transparency, and trust is vital to fostering a supportive and

successful environment for users, investors, and project initiators alike.

4.6.6 Limitations and Future Research

While this study provides valuable insights, it has several limitations that should be addressed in future research. The sample was drawn exclusively from Indonesia, which may limit its representativeness in a global context; expanding the sample to include participants from diverse regions could enhance the generalizability of the findings. Additionally, the cross-sectional design of the study offers only a snapshot of relationships between variables at a single point in time, suggesting the need for longitudinal studies to better understand causal relationships and the evolution of these factors over time. Future research could also incorporate additional variables, such as user experience, platform usability, or community engagement, to provide a more comprehensive understanding of the factors contributing to the success of blockchain-based decentralized crowdfunding.

5. CONCLUSION

This study has demonstrated that security, transparency, and trust are significant drivers of success in blockchain-based decentralized crowdfunding platforms in Indonesia. Security plays a central role in reducing participants' concerns about potential risks and fraud, which in turn enhances their willingness to engage in crowdfunding activities. Similarly, transparency serves as a vital factor in ensuring that project backers can verify the legitimacy of projects and track the progress of their investments, fostering a sense of confidence and reducing uncertainty. While trust has a somewhat lower impact compared to security and transparency, it remains an important component that influences participants' decisions and engagement in blockchain crowdfunding. Together, these three factors are crucial in shaping a successful decentralized crowdfunding platform that can attract more participants and generate greater investment. This study's results provide valuable insights for both platform developers and investors, emphasizing the importance of creating secure, transparent, and trustworthy platforms to enhance their success in the Indonesian market. Future research could expand the scope of the study to include more regions and investigate additional variables that might influence the success of blockchain crowdfunding platforms.

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