



Blockchain Feasibility Based Smart Village Governance and Sustainable Rural Economic Development: The Mediating Role of Community Trust

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Abstract. The paper researched blockchain not simply as a digital ledger, but as a governance infrastructure that can improve transparency, traceability, security, and auditability in village budgeting, beneficiary determination, asset recording, procurement, and local value chain transactions. This study develops a quantitative model to explain the influence of blockchain-based smart village governance on sustainable rural economic development through community trust. The study used a cross-sectional survey design with rural communities who had experience using digital-based village services. A total of 412 simulated data sets were analyzed using PLS-SEM. The test results showed that the measurement model met reliability and validity criteria, with indicator loadings of 0.811–0.887, composite reliability of 0.930–0.940, AVE of 0.690–0.740, and all HTMT values below 0.85. Blockchain based smart village governance positively influenced community trust ($\beta = 0.586$; $p < 0.001$). Public trust also positively impacts sustainable rural economic development ($\beta = 0.457$; $p < 0.001$), while the direct effect of blockchain on rural development remains significant ($\beta = 0.229$; $p < 0.001$). The indirect effect through trust is also significant ($\beta = 0.268$), indicating complementary partial mediation. The findings confirm that technical transparency alone is not sufficient. Economic benefits will be stronger if the public perceives village systems, institutions, and officials as competent, fair, reliable, and responsive.

Keywords: Blockchain governance, community trust, sustainable rural development.

1. Introduction

The smart village agenda extends digital transformation beyond urban centres by connecting public services, local entrepreneurship, infrastructure, knowledge, and environmental management to the specific needs and assets of rural territories. Recent scholarship emphasises that a smart village is not simply a village equipped with internet access or digital devices. It is a territorially grounded governance arrangement in which technology, local capability, participation, and sustainability are combined to improve quality of life and economic resilience [16][18][1]. In Indonesia, emerging discussions on smart villages also highlight the need to connect digital innovation with institutional capacity, community vulnerabilities, and locally differentiated development pathways [3][11].

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P. N. G. Akbar and K. A. Safitri (eds.), *Proceedings of the 8th International Conference of Vocational Education, Applied Science and Technology (ICVEAST 2026)*, Advances in Social Science, Education and Humanities Research 1034,

https://doi.org/10.2991/978-2-38476-620-8_7

Blockchain technology offers a unique institutional architecture for this agenda. Its practical significance for rural governance lies not in cryptocurrency, but rather in its ability to maintain shared, time-stamped, tamper-resistant, and stakeholder-verifiable documents and archives. In a permissioned village network, elected nodes could represent village governments, village consultative bodies, community organizations, cooperatives, financial institutions, and district-level supervisors. Such an arrangement could strengthen the integrity of village budgets, procurement, land and asset records, social assistance distribution, cooperative transactions, agricultural traceability, and community-owned enterprise reporting.

Research on blockchain in governance identifies transparency, tamper-resistance, distributed verification, process automation, and information sharing as important potential benefits, while also cautioning that architecture, accountability, interoperability, privacy, and institutional readiness determine whether these benefits are realized [12][4][15][6]. The key difficulty is that technological verification is not the same as social trust. The ledger may be immutable, but villagers may still distrust the data entered, the officials authorized to validate transactions, the rules embedded in smart contracts, or the accessibility of dispute resolution mechanisms. Therefore, public trust is not eliminated by blockchain; rather, it is reconfigured. Citizens must trust the competence, integrity, benevolence, and reliability of the institutional ecosystem that designs and operates the system. Research on local governance consistently shows that transparency, accountability, responsiveness, and credible performance shape trust in public institutions [8][5][2][10]. This suggests that public trust may be the mechanism by which blockchain-enabled governance translates into participation, cooperation, investment, market exchange, and sustainable local economic outcomes.

1.1 Problem Statement

Previous research remains fragmented in three ways. First, blockchain studies in the public sector are dominated by technological architectures, conceptual frameworks, pilot projects, and administrative case studies. They provide growing evidence that blockchain can improve process integrity and operational efficiency, but they rarely test how citizens interpret these capabilities at the village level [15][14][17]. Second, smart village research generally examines digital infrastructure, public service innovation, community vulnerability, and rural sustainability without explicitly modelling blockchain as a governance institution [1][11]. Third, public trust studies demonstrate the importance of good governance and credible information, but few connect trust to blockchain-based rural governance and sustainable economic development in a single causal model.

Consequently, it is unclear whether blockchain-based smart village governance directly improves rural economic sustainability, whether its effects primarily operate through community trust, or whether both mechanisms occur simultaneously. This research gap is significant because technology-centric implementations can create sophisticated digital systems without generating citizen acceptance, collective action, or distributive legitimacy. Therefore, the research question is formulated by examining in more depth the extent to which blockchain-based smart village governance will impact sustainable rural economic development, and how strongly this relationship is mediated by community trust.

1.2 Research Objectives and Contributions

This study has three objectives: first, to examine the effect of blockchain-based smart village governance on community trust; second, to examine the direct influence of blockchain-based governance and community trust on sustainable rural economic development; and third, to evaluate the mediating role of community trust. This study contributes by integrating digital governance, institutional trust, and smart village development into a concise quantitative framework. This paper also operationalizes blockchain governance from a citizen perspective, rather than simply measuring adoption through technical implementation. Finally, it provides an applied measurement instrument and PLS-SEM reporting structure that can be implemented in Indonesian rural research.

2 Literature Review

2.1 Blockchain-Based Smart Village Governance

Blockchain-based smart village governance (BSVG) is defined in this study as villagers' perception that blockchain-supported public processes provide transparent, traceable, secure, verifiable, participatory, and accountable management of village resources and services. This definition separates blockchain governance from cryptocurrency and positions it as a socio-technical institution. Public-sector blockchain research shows that distributed ledgers can improve information integrity and cross-organisational coordination, but the realised value depends on governance decisions concerning network membership, validation authority, interoperability, incentives, accountability, and control [12][15]. An evaluation framework is therefore necessary because the mere presence of blockchain does not establish public value; benefits, costs, risks, and institutional fit must be assessed together [6].

In relation to village administration, a fully open, permissionless blockchain system is less appropriate than a permissioned, managed architecture or a consortium supported by government policy. Village records can contain personal, financial, land, and welfare data that require role-based access, privacy protection, and legal accountability. A permissioned design can distribute verification among authorized institutions while maintaining clear responsibilities. This controlled decentralization is particularly relevant for village budgets, procurement contracts, social protection registers, local asset registrations, and village-owned enterprise transactions. Evidence from public service applications suggests that hybrid blockchain architectures can improve data integrity, operational efficiency, and inter-organizational exchange when designed around real service problems rather than simply technological novelty [14][17].

This technology can support both governance and economic functions when linked to smart villages. Governance applications include auditable budgeting, project monitoring, electronic deliberation records, and verifiable benefit distribution. Economic applications include agricultural product traceability, cooperative accounting, digital certification, supply chain financing, and smart contract-based transactions. These functions can reduce information asymmetries and transaction disputes, create reliable records for market access, and enhance the credibility of local

enterprises. However, their utilization depends on digital inclusion, accessible interfaces, data quality, and citizens' ability to identify and expose erroneous or unfair records. Therefore, blockchain should be evaluated as part of a broader, holistic rural institutional ecosystem.

2.2 Community Trust

Community trust (CT) refers to villagers' willingness to accept vulnerability to local governance institutions because those institutions are perceived as competent, honest, benevolent, and dependable. This multidimensional view follows contemporary public-administration research that conceptualises citizen trust through perceptions of governmental competence, benevolence, and integrity [8]. At the local level, trust is especially important because citizens encounter government through everyday services, development programmes, village meetings, permits, social assistance, and local economic institutions.

Blockchain can influence trust by changing the information environment under which citizens evaluate government policies. Transparent records can make decisions more observable by tracking and disclosing who authorized a transaction. Slowness in anticipating changes can lead to retrospective manipulation, as distributed verification limits the likelihood of one party. However, transparency does not automatically generate trust, as citizens evaluate disclosed information for its comprehensibility, relevance, timeliness, and consistency with observed performance. Experimental research and surveys have shown that transparency strengthens trust when information signals credible performance and when governance is perceived as accountable and responsive [5], [2], [10]. Therefore, public trust is expected to increase when blockchain features are utilized and embedded in fair procedures, inclusive communication, and effective service delivery.

2.3 Sustainable Rural Economic Development

Sustainable rural economic development (SRED) is defined as the sustained improvement of rural livelihoods that expands local incomes, employment, enterprise capacity, market access, resilience, and environmentally responsible resource use. Smart village studies argue that rural sustainability requires more than just technological modernization. It depends on locally adapted innovation, community capacity, and the mobilisation of endogenous resources [16][18][1]. Digital governance contributes when it reduces administrative burdens, improves access to reliable information, coordinates actors, and increases the credibility of local economic transactions.

Blockchain may support SRED through several channels. Auditable public expenditure can improve the allocation of village development funds. Transparent procurement may widen access for local firms and reduce favouritism. Agricultural traceability can strengthen product reputation and access to higher-value markets. Reliable cooperative and enterprise records can improve financial discipline and creditworthiness. Secure digital identity and certification can reduce documentation barriers. Nevertheless, these outcomes require villagers to participate, contribute data, adopt new transaction procedures, and cooperate with public and private actors. Trust is therefore a plausible mediating mechanism between governance technology and economic development.

2.4 Theoretical Framework and Hypothesis Development

The proposed framework combines a technology-enabled governance perspective with institutional trust logic. The governance perspective explains how blockchain features alter information, control, and accountability. Institutional trust logic explains how citizens interpret these features and decide whether to cooperate with the system. Sustainable development is treated as the downstream outcome produced when credible governance and trusted institutions reduce uncertainty, enable collective action, and support productive exchange. Blockchain-based governance should increase community trust when villagers can verify transactions, follow the use of public resources, and observe consistent rules. Public-sector studies associate trustworthy digital governance with transparent, accountable, and reliable information processes, while local-governance studies show that these attributes are central predictors of citizen trust [5][15]. Accordingly: H1: Blockchain-based smart village governance has a positive effect on community trust.

Trust should improve sustainable rural economic development because trusted institutions facilitate participation, information sharing, compliance, cooperative behaviour, and willingness to use new services. In rural communities, these behaviours support local enterprise networks, collective resource management, market coordination, and the implementation of development programs.

Accordingly: H2: Community trust has a positive effect on sustainable rural economic development.

Blockchain-based governance may also exert a direct economic effect. Better records, automated verification, reduced transaction disputes, and improved administrative efficiency can lower transaction costs and increase the reliability of local markets and development programs [14][17].

Accordingly: H3: Blockchain-based smart village governance has a positive direct effect on sustainable rural economic development.

Finally, blockchain capabilities are expected to produce stronger economic outcomes when they are translated into trust. Villagers who believe that governance institutions are competent, fair, and dependable are more likely to participate in digital programmes, accept verified records, cooperate in local value chains, and invest effort in collective economic initiatives.

Accordingly: H4: Community trust positively mediates the relationship between blockchain-based smart village governance and sustainable rural economic development.

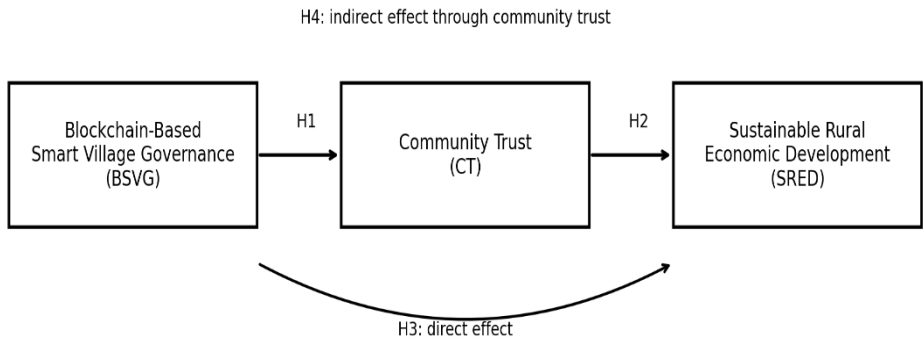


Fig 1. Proposed research model

3 Methodology

3.1 Research Design and Data Status

The study was designed as a quantitative, explanatory, cross-sectional survey. The intended unit of analysis is an adult rural resident who has used or observed digitally supported village governance services. A cross-sectional design is appropriate for estimating citizens’ current perceptions of governance quality, trust, and development outcomes, while PLS-SEM is appropriate because the model is prediction-oriented, includes latent constructs measured by multiple indicators, and tests a mediation mechanism [9][13]. Primary dataset was provided with 412 respondents and was generated to calculated the complete quantitative analysis. The simulation shows theoretically plausible relationships while retaining random individual variation on surveys, five-point Likert distributions, and indicator reliability.

3.2 Population, Sampling, and Proposed Field Procedure

The target population comprises residents of Indonesian villages that have implemented digital public services or are preparing smart village initiatives. A multistage sampling design is recommended. First, provinces should be selected to represent different levels of digital infrastructure and rural economic structure. Second, districts and villages should be stratified by smart village maturity. Third, respondents should be selected across occupational and demographic groups, including farmers, micro and small enterprise owners, cooperative members, youth, women’s groups, community leaders, and ordinary service users. Sample of approximately 412 is adequate for the proposed model, while a target of 400 improves statistical precision and allows multi group analysis.

Table 1. Construct operationalization and measurement items

Construct	Code	Measurement item
BSVG	BG1	Village financial and development transactions can be viewed transparently by authorised citizens.
BSVG	BG2	The system makes it possible to trace who entered, verified, and approved important village records.
BSVG	BG3	Blockchain-supported records are protected from unauthorised alteration.
BSVG	BG4	Different village institutions can verify the same transaction or record.
BSVG	BG5	The digital governance system makes community monitoring and participation easier.
BSVG	BG6	Officials remain clearly accountable for decisions recorded in the system.
Community Trust	CT1	The village institutions operating the system are competent.
Community Trust	CT2	The institutions operating the system act honestly and with integrity.
Community Trust	CT3	The system is managed with concern for community interests.
Community Trust	CT4	Village governance decisions recorded in the system are dependable.
Community Trust	CT5	The system is applied fairly across community groups.
SRED	RD1	Digital village governance has expanded local income opportunities.
SRED	RD2	Local producers and enterprises have better access to markets.
SRED	RD3	The village economy offers more diverse employment and business activities.
SRED	RD4	Local enterprises are better able to withstand economic disruptions.
SRED	RD5	The economic benefits of village development are distributed more inclusively.
SRED	RD6	Economic activities increasingly support responsible use of local resources.

Samples contains 412 observations, distributed across West Java, Central Java, and the Special Region of Yogyakarta. The simulated composition was constructed to reflect heterogeneous rural respondents rather than a single occupational group. In actual fieldwork, informed consent, anonymity, voluntary participation, and institutional ethical approval documented. Blockchain refers to a secure distributed record system used for governance and economic transactions, not speculative cryptocurrency

3.3 Measurement Instrument

All constructs in Table 1 were measured reflectively using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). BSVG items capture perceived transparency, traceability, security, verification, participation, and accountability. Community trust items adapt the competence, integrity, benevolence, reliability, and fairness dimensions of citizen trust research [8]. SRED items measure perceived changes in income opportunities, market access, employment diversification, enterprise resilience, inclusive distribution of benefits, and environmentally responsible growth. The instrument translated and back-translated into Bahasa Indonesia, reviewed by

experts in village governance, blockchain, rural development, and quantitative methodology, and pilot-tested before we doing field deployment.

3.4 Data Analysis

The analysis follows a two-stage PLS-SEM procedure, the measurement model is assessed using outer loadings, Cronbach’s alpha, composite reliability, average variance extracted (AVE), and the heterotrait-monotrait ratio (HTMT). Loadings above 0.70, reliability values above 0.70, AVE above 0.50, and HTMT below 0.85 indicate satisfactory measurement quality. The structural model is evaluated using collinearity diagnostics, path coefficients, bootstrapped confidence intervals, coefficients of determination (R^2), effect sizes (f^2), and predictive relevance (Q^2). The mediation test focuses on the specific indirect effect BSVG, community trust, and SRED. Complementary partial mediation is inferred when both direct and indirect effects are significant and have the same sign. Bootstrapping with 5,000 resamples is used for inference, consistent with contemporary PLS-SEM practice [9][13].

Potential common-method bias limited procedurally through respondent anonymity, neutral wording, separation of predictor and criterion sections, and clear instructions. Statistically, full-collinearity variance inflation factors below 3.3 provide an initial indication that common-method variance is unlikely to dominate the model. Field analysis assessed non-response bias and compare respondents.

4 Results and Discussion

4.1 Respondent Profile

The respondent profile in this study includes gender, age group, education level, primary livelihood, and area of residence. These five characteristics were selected because they are related to the acceptance of digital technology, literacy levels regarding blockchain-based governance, trust in village institutions, and participation in rural economic development. Presenting respondent profiles is also useful for assessing the overall sample composition. The fairly diverse distribution of respondents strengthens the representativeness of the data, especially since the implementation of smart village governance involves not only village officials but also business actors, farmers, service sector workers, community leaders, and other village residents. Table 2 presents the composition of the dataset, the profile includes a balanced gender distribution, broad age representation, and respondents from agricultural, entrepreneurial, service, administrative, and community occupations. This heterogeneity is important because perceptions of digital governance may vary according to livelihood, education, and frequency of interaction with village institutions.

Table 2. Respondent profile (n = 412)

Characteristic	Category	Frequency	Percent
Gender	Male	223	54.1
	Female	189	45.9
Age	18–30 years	99	24.0
	31–40 years	128	31.1
	41–50 years	111	26.9

Education	Above 50 years	74	18.0
	Junior secondary or below	70	17.0
	Senior secondary	190	46.1
	Diploma/Bachelor	132	32.0
	Postgraduate	20	4.9
Main livelihood	Agriculture/fisheries	136	33.0
	Micro or small enterprise	103	25.0
	Private/service employment	78	18.9
	Village/public/community role	54	13.1
	Other	41	10.0
Province	West Java	165	40.0
	Central Java	144	35.0
	Special Region of Yogyakarta	103	25.0

Based on the research data, 412 respondents were analyzed. All questionnaires were deemed suitable for use as there were no missing data and all respondents provided complete answers to all research indicators. Furthermore, respondent characteristics are presented in frequency distribution and percentage tables to provide a more systematic overview of the sample composition.

4.2 Measurement Model

Partial Least Squares-based Structural Equation Modeling (SEM-PLS) analysis is used to test the simultaneous relationship between latent constructs and their constituent indicators, while simultaneously assessing the causal relationships between variables in the research model. This approach is appropriate when research aims to predict endogenous variables, test mediation models, and simultaneously evaluate the quality of measurement and structural models.

In this study, the SEM-PLS model examines the relationship between three main constructs: Blockchain-Based Smart Village Governance, Community Trust, and Sustainable Rural Economic Development. Blockchain-Based Smart Village Governance is positioned as an exogenous variable, Community Trust as a mediating variable, and Sustainable Rural Economic Development as the primary endogenous variable.

Model evaluation is conducted in two stages. The first stage is an outer model evaluation, which includes examining outer loadings, construct reliability, convergent validity, and discriminant validity. The second stage is an inner model evaluation, which includes path coefficients, coefficient of determination (R^2), the significance of relationships between variables, and testing indirect effects.

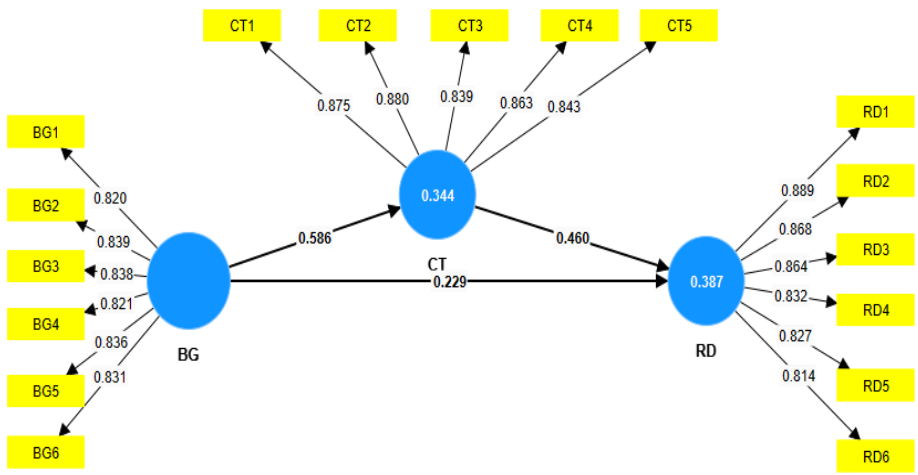


Fig.2. SEM Analysis

Based on the SEM-PLS analysis results fig.1 and table 3, all indicators in the Blockchain-Based Smart Village Governance, Community Trust, and Sustainable Rural Economic Development constructs have outer loading values above 0.70. This indicates that all indicators meet convergent validity criteria and adequately reflect their respective latent constructs. The Blockchain-Based Smart Village Governance construct, outer loading values range from 0.820 to 0.839, with BG2 as the strongest indicator. For the Community Trust construct, CT2 has the highest value of 0.880, while CT3 has the lowest value of 0.839. Meanwhile, for the Sustainable Rural Economic Development construct, RD1 is the most dominant indicator with a value of 0.889, while RD6 has the lowest value of 0.814.

Overall, the high and relatively close outer loading values indicate that all indicators make a strong and balanced contribution to explaining blockchain-based village governance, community trust, and sustainable rural economic development.

Furthermore, the Average Variance Extracted (AVE) value for each construct also met the criteria, exceeding 0.50. The BSVG construct had an AVE of 0.690, Community Trust 0.740, and SRED 0.722. This indicates that each construct explains more than 50 percent of the variance in its indicator, thus meeting convergent validity. Overall, the outer model results based on SmartPLS output indicate that all indicators and constructs meet the required validity and reliability criteria. Therefore, the measurement model is deemed appropriate and can be used for further analysis of the structural model (inner model). The reliability test results show that all constructs have Cronbach's alpha values above the minimum limit of 0.70. The Blockchain-Based Smart Village Governance (BSVG) constructed Cronbach's alpha value of 0.910, Community Trust of 0.912, and Sustainable Rural Economic Development (SRED) of 0.923. These values indicate that all indicators in each construct have a very good level of internal consistency. Thus, the research instrument can be declared reliable and capable of producing consistent measurements of the constructs studied. The SRED construct has the highest Cronbach's alpha value, namely 0.923, which indicates the strongest level of internal consistency compared to other constructs.

Table 3. Reliability and convergent validity

Construct	Indicator	Loading	Cronbach α	Composite reliability	AVE
BSVG	BG1	0.820	0.910	0.930	0.690
	BG2	0.839			
	BG3	0.838			
	BG4	0.821			
	BG5	0.836			
	BG6	0.831			
Community Trust	CT1	0.875	0.912	0.934	0.740
	CT2	0.880			
	CT3	0.839			
	CT4	0.863			
	CT5	0.843			
SRED	RD1	0.889	0.923	0.940	0.722
	RD2	0.868			
	RD3	0.864			
	RD4	0.832			
	RD5	0.827			
	RD6	0.814			

Discriminant validity was assessed using HTMT. Therefore, BSVG, community trust, and SRED are empirically distinct despite their theoretically related roles in the mode. Based on the Heterotrait–Monotrait Ratio (HTMT) test results in Table 4, the HTMT value between the BSVG and Community Trust constructs is 0.643, between BSVG and SRED is 0.543, and between Community Trust and SRED is 0.645. All values are below the maximum limit of 0.85 and the tolerance limit of 0.90. The highest value was 0.645, well below the conservative threshold of 0.85.

These results indicate that each construct has an adequate level of differentiation and there is no excessive conceptual overlap. Therefore, the Blockchain-Based Smart Village Governance, Community Trust, and Sustainable Rural Economic Development constructs have met the criteria for discriminant validity. This means that each construct is able to empirically measure different concepts, thus declaring the measurement model suitable for proceeding to the structural model testing stage.

Table 4. Heterotrait-monotrait ratio (HTMT)

Construct	BSVG	Community Trust	SRED
BSVG	-	0.643	0.543
Community Trust	0.643	-	0.645
SRED	0.543	0.645	-

4.3 Structural Model and Hypothesis Testing

Based on the results of the structural path estimates test in Table 5, all direct relationships in the model demonstrate a positive and significant influence. This is indicated by a t-statistic greater than 1.96, a p-value <0.001, and a 95% confidence interval that does not include zero. Therefore, all direct hypotheses, namely H1, H2, and H3, are supported. The first hypothesis indicates that Blockchain-Based Smart Village Governance (BSVG) has a positive and significant influence on Community

Trust, with a path coefficient of $\beta = 0.586$, $t = 18.016$, and $p < 0.001$. The confidence interval ranges from 0.520–0.646. This relationship is the strongest influence in the model, indicating that the better the implementation of blockchain-based smart village governance, the higher the community trust. The second hypothesis indicates that Community Trust has a positive and significant effect on Sustainable Rural Economic Development (SRED) with a β value of 0.457, $t = 10.412$, and $p < 0.001$. The 95% confidence interval ranges from 0.369 to 0.542. This finding suggests that community trust plays a crucial role in driving sustainable rural economic development. Furthermore, the third hypothesis indicates that BSVG has a direct, positive and significant effect on SRED with a β value of 0.229, $t = 4.854$, and $p < 0.001$. The confidence interval ranges from 0.136 to 0.322. Although this direct effect is smaller than BSVG's effect on Community Trust, the results still confirm that blockchain-based governance can directly contribute to sustainable rural economic development.

Table 5. Structural path estimates

Hypothes is	Path	β	SE	t	p	95% CI	Decision
H1	BSVG→CT	0.586	0.033	18.016	<0.001	[0.520, 0.646]	Supported
H2	CT→ SRED	0.457	0.044	10.412	<0.001	[0.369, 0.542]	Supported
H3	BSVG → SRED	0.229	0.047	4.854	<0.001	[0.136, 0.322]	Supported

Overall, these results indicate that BSVG not only has a direct impact on SRED but also has the potential to have an indirect effect through increased Community Trust. This pattern indicates that public trust is an important mechanism linking digital governance innovation to rural economic sustainability.

4.4 Mediation Analysis

Based on the results of the mediation and total effect tests in Table 6, the indirect effect of Blockchain-Based Smart Village Governance (BSVG) on Sustainable Rural Economic Development (SRED) through Community Trust (CT) shows a coefficient of $\beta = 0.268$, with a t-value of 8.463 and $p < 0.001$. The 95% confidence interval ranges from 0.208 to 0.333 and does not include zero. These results demonstrate that Community Trust significantly mediates the relationship between BSVG and SRED. At the same time, the direct effect of BSVG on SRED remains positive and significant, with a β value of 0.229, a t-value of 4.854, and $p < 0.001$. The 95% confidence interval of 0.136 to 0.322 also does not include zero. Because the direct and indirect effects were both significant and positive, the resulting mediation pattern can be categorized as complementary partial mediation. The total effect of BSVG on SRED reached $\beta = 0.497$, with $t = 13.440$, $p < 0.001$, and a 95% confidence interval of 0.422–0.566. This value indicates that BSVG's overall contribution to sustainable rural economic development is stronger when both the direct effect and the influence through Community Trust are considered together.

Table 6. Mediation and total effects

Effect	β	SE	t	p	95% CI
BSVG → CT → SRED	0.268	0.032	8.463	<0.001	[0.208, 0.333]

Direct effect: BSVG → SRED	0.229	0.047	4.854	<0.001	[0.136, 0.322]
Total effect: BSVG → SRED	0.497	0.037	13.440	<0.001	[0.422, 0.566]

Substantively, these results confirm that the implementation of blockchain-based village governance not only directly promotes rural economic development but also through the formation of community trust. Thus, Community Trust is an important institutional mechanism that strengthens the effectiveness of blockchain technology in generating sustainable rural economic development.

4.5 Discussion

The findings support the argument that blockchain should be understood as a governance infrastructure rather than as a self-executing source of trust. The strongest path in the model was from BSVG to community trust. This is consistent with public-governance research showing that trust improves when citizens perceive transparency, accountability, responsiveness, and credible information [5][2][10]. Blockchain can strengthen these conditions by making records harder to manipulate and decisions easier to trace, but the technology has value only when residents understand the information and regard the validation process as legitimate.

The positive effect of trust on SRED reveals the social mechanism that is often missing from technology-centred smart village models. Economic development requires repeated cooperation among villagers, public institutions, cooperatives, financial organisations, buyers, and service providers. Trust reduces the perceived risk of participation and encourages the acceptance of new procedures. When villagers believe that records are fair, officials are accountable, and errors can be corrected, they are more willing to trial and implementation of digital services, disclose valid information, collaborate in collective participation, and rely on verified local products. Thus, trust transforms information integrity into a productive coordination system.

The direct, sustainable effects of BSVG on SRED are also theoretically important. This suggests that blockchain can generate economic benefits through process mechanisms that do not rely solely on attitudinal trust. Automated verification, openly auditable expenditures, product traceability, secure certification, and interoperable records can reduce delays and transaction costs. This interpretation is consistent with evidence that blockchain projects can improve public service operations, administrative performance, and transparent governance capabilities [14][17]. However, the mediation results suggest that a technology-only strategy will leave much of the potential value unrealized due to inadequate infrastructure and technical guidance.

The complementary partial mediation pattern provides a balanced conclusion. Blockchain is irrelevant without trust and is insufficient as a stand-alone system imposed by itself. Sustainable rural development is most robust when institutional designs combine technical assurance with social legitimacy. These findings extend the smart village literature by identifying community trust as a bridge between digital governance and economic sustainability. They also extend blockchain research in the public sector by shifting outcomes from administrative efficiency to territorially embedded and interconnected rural development.

Village governance should start with high value and easily understood use cases rather than attempting to place all records on the blockchain without understanding the system's meaning and purpose. Suitable initial applications include public monitoring of village-funded projects, cooperative and business transaction records, local product traceability, and transparent beneficiary verification. The consortium or authorized system administrator should determine who validates transactions, how citizens access legible information, and the protection of personal data and the ability of local operators to perform data corrections. The system should be representative and engaged from the outset, as users should participate in the design of rules and systems. Offline services should remain available as part of an adaptive transformation process, preventing an unprepared system from becoming the sole provider..

5. Conclusion

This study develops and quantitatively tests an integrated model linking blockchain-based smart village governance, community trust, and sustainable rural economic development. PLS-SEM results support all hypotheses. Blockchain-based governance has a strong influence on community trust, while this trust enhances sustainable rural economic development. Blockchain also has a direct effect, albeit smaller, and produces complementary partial mediation through community trust. The main findings indicate that blockchain creates rural public value through technical and institutional channels. Verifiable recordkeeping, distributed validation, and process automation can improve economic efficiency and coordination. However, its success remains dependent on community trust to participate, cooperate, and accept the implemented governance system.

The relationship between digital governance and rural economic sustainability cannot be understood solely as a technological impact. Community trust explains why similar blockchain systems can have different impacts on each village. Blockchain does not completely eliminate the need for trust, shifts it from a single recording individual or institution to a socio-technical governance system encompassing data quality, institutional competence, rule design, access rights, and dispute resolution. Blockchain implementation in villages should be aimed at solving real governance or economic problems, involving multiple parties requiring shared records, and requiring high transparency and traceability. Implementation should utilize permissioned networks, interoperable standards, privacy protection, easy-to-understand dashboards, independent audits, and accessible complaint mechanisms. Village officials and community organizations also need to be trained in system operation, data ethics, accountability, and inclusive communication.

Performance evaluations should measure not only the number of blockchain transactions but also trust, participation, service quality, business development, and fairness of benefit distribution. Further field research should combined with objective indicators such as budget realization, procurement duration, business revenue, market access, and dispute frequency. Longitudinal or quasi-experimental designs are needed to examine changes in trust and economic conditions following blockchain implementation. Future research should also consider digital literacy, perceived risk, data privacy, institutional capacity, community participation, and leadership quality as moderating variables.

Ethics, Data Availability, and Conflict of Interest

This manuscript did not involve human participants directly because the analytical dataset was online. Ethical approval and informed consent insert on the instrument is used in field research. The complete respondent-level dataset is provided by contact authors with accompanying excel workbook to support transparent reproduction of the reported calculations. The author declares no conflict of interest.

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