Research on The Application of Blockchain in Social Governance

Lin Chen

531508126@qq.com

Beijing Jiaotong University , Beijing, China

Abstract: This article aims to explore the application research of blockchain technology in social governance. Firstly, this article will introduce the impact mechanism and theoretical assumptions of blockchain technology in social governance, analyze its characteristics and advantages, as well as its important role in social governance. Then, this article will demonstrate the empirical analysis of the application of blockchain technology in social governance, including questionnaire collection and sources, reliability and validity testing, and empirical testing. Finally, this article will summarize the potential and challenges of blockchain technology in social governance, as well as its future development prospects, in order to promote innovation and development in social governance.

Keywords: Blockchain; Social Governance: Empirical Research

1. Introduction

In today's rapidly developing society, blockchain technology, as a disruptive decentralized distributed ledger system, is gradually becoming an important force in promoting the modernization of social governance. Its unique encryption algorithm and consensus mechanism ensure the security and reliability of data information, improve the transparency and traceability of social governance, help reduce the occurrence of corruption and fraud, and improve the efficiency and credibility of social governance[1]. However, the application of blockchain technology in social governance is still in the exploratory stage, and there are many challenges and challenges. This article aims to delve into the application research of blockchain technology in social governance. Firstly, this article will analyze the characteristics and advantages of blockchain technology, as well as its important role in social governance. Then, this article will demonstrate the empirical analysis of the application of blockchain technology in social governance, including questionnaire collection and sources, reliability and validity testing, and empirical testing. Finally, this article will summarize the potential and challenges of blockchain technology in social governance, as well as its future development prospects, in order to promote innovation and development in social governance.

PMBDA 2023, December 15-17, Nanjing, People's Republic of China

DOI 10.4108/eai.15-12-2023.2345338

2. The Specific Application of Blockchain Technology in Social Governance

2.1 Identity Based Management

Blockchain technology can provide secure, transparent, and reliable solutions for identity management. Using blockchain technology can create digital identities, thereby avoiding identity fraud and theft. Identity based management can also be used to address policy issues such as elections, immigration, and social security[2].

2.2 Smart Contracts

Blockchain technology can automatically execute smart contracts, demonstrating its importance in various fields. A smart contract is a self-executing and self-executing contract that converts the terms of the contract into code and can be automatically executed.

2.3 Application of Blockchain Technology in Public Security

Blockchain technology can be promoted and applied in fields such as public security departments, judicial authorities, regulatory agencies, etc. It is best to start from the aspects of fake certificates, trust authentication, and data chain capabilities, and standardize and standardize the processing. It can also effectively prevent judicial data fraud and modification[3].

2.4 Social Welfare Undertakings Such As Relief, Donations, and Elections

By combining blockchain technology and IoT technology, a data trust transmission system for IoT devices can be established. Provide a strong basis for credit evaluation platforms by detecting the operation of equipment and devices through various means, as well as subscribing to daily logistics[4]. Decentralized Autonomous System (DAO) is a widely studied and discussed blockchain application. DAO is a decentralized and autonomous organization, and all its rules and operations are automatically executed by smart contracts. These rules and operations are completely transparent, and no one can tamper with them. At the same time, DAO also largely bypasses the obstacles of traditional social structures, providing a new approach to social governance.

3. The Impact Mechanism and Theoretical Assumptions of Blockchain on Social Governance

3.1 The Impact Mechanism of Blockchain on Social Governance

3.1.1 Blockchain Diversification Discussion

Using blockchain as the main carrier, integrate various social resources, and construct a new multi-dimensional decision-making mechanism that combines top-down and bottom-up approaches. Download the grid based social governance app, establish trust through real name authentication, and each login is a grid member. If any problems or suggestions are found, they can send out discussion requests at any time. Various entities such as neighborhood committees, streets, community enterprises, and building owners can select the necessary topics for the

discussion requests. Once selected as a topic, diversified discussion and negotiation will be conducted, from providing opinions when problems are discovered to reviewing the proposed issues, from making comments and decisions to reporting the results, the entire process is open, controllable, and trust can be transmitted. For government advocacy and suggestions, the community has issued a call through the APP to encourage various entities such as community party members and volunteers to actively participate, and can provide feedback through the APP to gather people's hearts, wisdom, and strength, solve civil issues, meet people's needs, and participate in the deliberation process and results that can be checked, inquired about, and traced.

3.1.2 Blockchain Grid Governance

Based on the advantages of blockchain technology such as decentralization and non tampering of information, it can ensure the authenticity and credibility of data in the grid based social governance chain, ensure the openness and transparency of information, and ensure reliable transmission channels and a thriving trust network[5]. However, the governance content of grid based social governance is rich (stability maintenance, services, public security, etc.), with diverse service targets (elderly groups, migrant population, women and children, general public, etc.), diverse governance regions (rural, urban, economically developed areas, economically underdeveloped areas, etc.), and variable governance environments (such as epidemic periods, normal periods, and special action periods). Therefore, relying solely on blockchain technology to ensure the authenticity and credibility of data Establishing trust relationships among various entities is not enough. It is necessary to analyze various complex problems, situations, and relationships through big data technology, identify the needs of different groups, and provide personalized services; Analyze strengths and weaknesses, select effective governance models; Predict future trends and plan well. Only in this way can we maximally eliminate issues such as information asymmetry, low trust, and virtual grid governance.

3.1.3 Blockchain Corruption Governance

One of the common difficulties in corruption governance is the fragmentation and confusion of clues, with a large amount of information scattered on various "information silos" that are difficult to share, and it is also difficult to achieve the goal of putting all information on public platforms. In case review, it is more common for the investigation department to request specific scope of information, and this process of obtaining information is easily alienated by the controller of the "information monopoly", and fragmented information collection also faces the dilemma of legality. The "Provisions of the Supreme People's Court on Several Issues Concerning the Trial of Cases by Internet Courts" implemented on September 7, 2018, recognize the legitimacy of blockchain evidence, and legal authorization can fully utilize the technological advantages of blockchain to resolve the constraints of information asymmetry on information review. The "Tianping Chain" organized by the Beijing Internet Court is a successful attempt to apply blockchain technology to internet case investigation, information transmission, evidence chain verification and preservation. It has 17 nodes and completes the application data docking between 24 internet data platforms and certificate storage platforms. The "Tianping Chain" not only ensures the security of evidence transmission for parties involved, but also ensures the efficiency of court evidence collection, providing a successful demonstration for the application of blockchain in the field of corruption governance - the "integrity information chain".

3.2 Suggest A Hypothesis

In modern society, blockchain technology, as a disruptive decentralized distributed ledger system, is gradually becoming an important force in promoting the modernization of social governance. This article will delve into the three impact mechanisms and theoretical assumptions of blockchain technology in social governance, in order to provide useful insights for future research.

The first assumption is that blockchain technology can improve the transparency and traceability of social governance, thereby increasing fairness and trust. Blockchain technology has unique encryption algorithms and consensus mechanisms to ensure the security and reliability of data information. By storing information on the blockchain, anyone can view and verify transaction records, ensuring the authenticity and credibility of data content. As a result, blockchain technology can effectively reduce the occurrence of corruption and fraud, and improve the efficiency and credibility of social governance.

The second assumption is that blockchain technology can promote social participation and democratic decision-making. Traditional social governance often relies on central authoritative institutions or governments for decision-making and management, while blockchain technology provides individuals with direct opportunities to participate and vote. Based on decentralized autonomous organizations and smart contracts, people can fully participate in social decision-making processes, thereby making social governance more democratic and inclusive.

The third assumption is that blockchain technology can change power structure and distribution. Traditional social governance often faces issues of power concentration and inequality, and blockchain technology can break this pattern. By constructing decentralized networks and smart contracts, power can be more dispersed and equally distributed to participants, thereby achieving more just and balanced social governance.

4. Empirical Analysis of The Application of Blockchain in Social Governance

4.1 Questionnaire Collection and Sources

4.1.1 Questionnaire Collection

This study attempted to consider the regional distribution of the samples in the eastern, central, and western regions of China during the sampling process. A total of 1000 questionnaires were collected. After careful screening, 898 valid questionnaires were obtained. The sample structure is shown in Table 1.

Table 1 Sample Population Structure (N=898)

Variable	Category	Proportion (%)
Gender	Male	59.5
	Female	40.5
Age	Under 18 Years Old	0.8
	18-25 Years Old	21.8
	26-30 Years Old	13.1

	31-40 Years Old	30.4
	41-50 Years Old	21.6
	Above 51-60 Years Old	9.5
	Over 60 Years Old	2.8
Marital Status	Unmarried	36.0
	Married	45.1
	Divorce	88
	Bereft of One's Spouse	10.1
Education Level	Master Degree or Above	27.4
	Degree	48.0
	College Associate Degree	11.2
	High School (Technical Secondary School)	7.7
	Middle School	5.0
	Primary School and Below	0.7
Nature of Work	Government Agencies	17.8
	Public Institutions	29.3
	State-Owned Enterprise	3.9
	Private Enterprise	21.8
	On The Drift	9.0
	Not Working	18.2
Years of Service	Less Than 1 Year	23.8
	2 Years	5.8
	3-5 Years	7.9
	5-10 Years	17.9
	10-20 Years	24.9
	Over 20 Years	19.7
Personal Monthly Income	Below 3000 Yuan	27.6
	3001-8000 Yuan	43.7
	8001-10000 Yuan	13.7
	10001-20000 Yuan	11.4
	20001-50000 Yuan	2.3
	Above 50000 Yuan	1.3
Area	Eastern Region	42.3
	Central Region	47.3
	Western Region	10.2
	Hong Kong, Macao and Taiwan Region	0.2

4.1.2 Source of Variables

In terms of variable design, considering that there is not fully corresponding and accurate publicly available secondary data that can measure all relevant variables in this study, we draw on existing literature practices and use first-hand survey data for subjective "latent variable" measurements to relatively accurately understand the true attitudes and thoughts of the public. On the basis of fully drawing on existing research results, this study determined the measurement variables and solicited the opinions of experts in the field to ultimately complete the survey questionnaire design.

4.2 Reliability and Validity Testing

To ensure the accuracy of validity and reliability testing data, the following points need to be followed: clear testing objectives, reasonable design of testing, standardization of implementation process, randomization of question order, sample representativeness, rationality of test scores, feedback of test results, continuous optimization of test content, combination of multiple testing methods, and regular review. Clear and clear testing objectives help to ensure the targeted and effective testing content; Reasonably designing tests requires selecting representative questions with diverse question types and avoiding ambiguity or misleading statements.

4.2.1 Reliability Test

Prior to the formal survey, this study also used convenience sampling to distribute 200 pre survey questionnaires and collected 189 valid questionnaires for exploratory factor analysis. This study adopts the commonly used Cronbach'sαapproach in academia. The coefficient is used to test the reliability of the pre survey questionnaire. The reliability test results of each variable in this study are shown in Tables 2 and 3. The factor loads of each major variable are greater than the standard of 0.5, and the internal consistency coefficients of each construct (Cronbach'sα) Both are greater than 0.7, indicating that this scale has good reliability.

According to Table 2, the variable names for three different governance factors are presented, namely transparency governance, resident decision-making governance, power structure governance, factor values, and Cronbach's α Coefficient, KMO value, Bartlett's Test, and explained percentage of variance. The transparency governance factor has high factor values and Cronbach's α The coefficient and KMO value indicate high internal consistency and reliability. However, the factor values and statistical parameters of residents' decision-making governance and power structure governance factors are relatively low, indicating poor internal consistency and reliability. The percentage of variance explained shows that the transparency governance factor can better explain the variance of 61.369%, while the residents' decision-making governance and power structure governance factors can explain the variance of 15.562% and 9.577%, respectively. Therefore, based on the analysis of this table, it can be concluded that the transparency governance factor has higher importance and reliability in governance research.

Table 2 Exploratory Factor Analysis Results of Social Security Governance Modernization Strategy (N=189)

Variable	Factor 1	Factor 2	Factor 3	Cronbach's α	KMO	Bartlett's Test	Explained Variance %
Transparency Governance	0.910	0.231	0.216	0.961	0.854	0	61.369
	0.910	0.180	0.244				
	0.902	0.225	0.262				
Resident Decision-Making Governance	0.179	0.889	0.289	898			15.562
	0.169	0.876	0.289				
	0.301	0.755	0.243				
Governance of Power Structure	0.267	0.205	0.870	0.893			9.577
	0.271	0.319	0.816				
	0.220	0.413	0.754				

Table 3 Summary of Exploratory Factor Analysis Results for Social Security Level (N=189)

Variable	Measurement indicators	Factor 1	Cronbach's α	KMO	Bartlett's Test	Explained Variance %
Social Governance Level	F7	0.905	0.956	0.921	0	69.699
	F6	0.885				
	F1	0.879				
	F2	0.877				
	F3	0.871				
	F4	0.857				
	F8	0.819				
	F10	0.797				
	F5	0.772				
	F9	0.742				

4.2.2 Validity Test

From Table 3, it can be seen that the measurement indicators and related factors of social governance level are Cronbach's α Coefficient, KMO value, Barrett's Test, and explained percentage of variance. According to the table data, it can be seen that the measurement indicator F7 of social governance level has a high Cronbach's α. The coefficients and KMO values indicate high internal consistency and measurability. Meanwhile, the value of Barrett's Test is 0, explaining a variance of 69.699%, which further supports the effectiveness of F7 as a measurement indicator of social governance level. The measurement indicators of other factors also show a certain degree of internal consistency and measurability, but are slightly lower compared to F7. Therefore, it can be concluded that F7 is one of the most effective indicators for measuring the level of social governance.

This study conducted content validity and structural validity tests using a scale. Due to the design of the scale being based on mature research results and soliciting opinions from multiple experts in related fields, the scale has high content validity. The results of exploratory factor analysis are shown in Tables 2 and 3. Among them, the KMO values (greater than 0.7) and Bartley's spherical test ($P<0.05$) of each variable are within the critical values, indicating that exploratory factor analysis is suitable. The factor load of each variable in different dimensions is greater than 0.5, and there is no cross factor load phenomenon, indicating that the scale in this study has high structural validity. The above analysis results indicate that the measurement scale designed in this study can better reflect the basic connotation of the underlying variables behind it.

On the basis of exploratory factor analysis, this study distributed 1000 formal survey questionnaires as mentioned above, collected 898 valid questionnaires, and conducted confirmatory factor analysis on all variables involved in this study using the formal survey questionnaire. The inspection results are shown in Table 4. Firstly, from the Cronbach's α values of each variable, it can be seen that they are all greater than the critical requirement of 0.7. Based on this, it can be concluded that the various variables in this study have good reliability. Secondly, according to the validity test results of each variable, the average variance extraction (AVE) is higher than 0.5, indicating that each measurement variable has high aggregated validity. Finally, according to the fitness test results of the measurement models for each variable, it can

be seen that the RMSEA values in the dimension factors of each variable are greater than or equal to 0.08, which meets the critical value requirements of the academic community. From the NFI, NNFI, CFI, IFI, and GFI index values of each variable, it can be seen that their indicator values are all greater than 0.9, and the x2/df values are between 1 and 5, indicating a good fit. This indicates that the fitting values of each measurement model are in line with the critical value requirements of academic research.

Table 4 Confirmatory Factor Analysis Results of Main Variables (N=898)

Main Variables	Dimension	Cronbach's α	AVE	Measurement Model Adaptability Test Results
Blockchain Technology Governance	Transparency Governance	0.896	0.656	RMSEA=0.073<0.08; 1<X2/df=4.92<5; NFI=0.96、NNFI=0.95、CFT=0.97、IFT=0.97、GFT=0.93
	Resident Decision-Making Governance	0.728		
	Governance of Power Structure	0.888		
Social Governance Level		0.930	0.671	RMSEA=0.000<0.08; 1<X2/df=2.57<5; NFI=0.98、NNFI=0.97、CFI=0.97、IFI=0.97、GFI=0.95

4.3 Empirical Testing

Using multiple regression methods, an empirical test was conducted on the impact of three governance strategies for modernization of social security governance on the level of social security, namely verifying hypothesis 1, hypothesis 2, and hypothesis 3. The specific inspection results are shown in Table 5:

Table 5 Test Results of the Impact of Comprehensive Strategies for Modernization of Social Security Governance on the Level of Social Security (N=898)

Model	M1	M2	M3	M4
Variable	Social Governance Level	Social Governance Level	Social Governance Level	Social Governance Level
Age	0.266**	0.147**	0.083*	0.080**
Gender	0.035	0.064*	0.043	0.057
Marital Status	-0.026	-0.010	-0.011	0.000
Education Level	0.035	0.018	-0.005	-0.030
Government Agencies	0.041	0.033	0.068	0.050*
Public Institutions	0.052	0.050	0.073**	0.061
Years of Service	-0.183*	-0.072	-0.039	-0.038
Income	0.032	0.009	0.009	0.010
Eastern Region	0.082**	0.071*	0.073**	0.058*
Western Region	-0.040	-0.027	-0.023	-0.001
Fairness and Trust in Social Governance		0.567**	0.240**	0.024

(Transparency Governance)				
Resident Discourse Power (Resident Decision-Making Governance)			0.521***	0.362**
Concentration of Power and Inequality (Governance of Power Structure)				0,436**
F	5.40	47.086	80.973	99.486
R^2	0.057	0.361	0.517	0.588
AR^2		0.312	0.154	0.071
DW	1.898			

Note: * represents p<0.05** Indicates P<0.01* Indicates P<0.01; R2 is the adjusted value, and ΔR^2 is the unadjusted value.

First, the results of model M2 show that on the basis of control variable model M1, the independent explanatory power of M2 increases after the high liquidity governance strategy variable is put into regression model M1 (AR2=0.312p<0.001). Meanwhile, the M2 results of the model indicate that blockchain technology can provide transparency and traceability (B=0.567, p<0.001), and hypothesis 1 is validated.

Second, the results of model M3 show that, on the basis of control variable model M1, the independent explanatory power of M3 increases after the high networked governance strategy variable is put into regression model M1 (AR2=0.154p<0.001). Meanwhile, the results of model M3 indicate that blockchain technology can promote social participation and democratic decision-making (B=0.521, p<0.001), and hypothesis 2 is validated.

Thirdly, the results of model M4 show that, on the basis of control variable model M1, the independent explanatory power of M4 increases after the highly knowledgeable governance strategy variable is put into regression model M1 (AR2=0.071. p<0.001). Meanwhile, the results of model M4 indicate that blockchain technology can change power structure and distribution (B=0.436, p<0.001), and hypothesis 3 is validated.

In addition, from the various collinearity test results of each model in this study, it can be seen that its tolerance is less than 10, and the variance inflation factor (VIF value) is less than 3, which meets the general requirements of the academic community. From the Durbin Watson value, its DW is 1898, which is relatively close to 2, indicating that there is no autocorrelation phenomenon in the residuals of each variable

5. Conclusion

After the theoretical assumptions and empirical analysis of this article, the following conclusions are drawn.

(1) Blockchain technology improves the transparency and traceability of social governance: Based on its unique encryption algorithm and consensus mechanism, blockchain technology

can ensure the security and reliability of data information, and improve the transparency and traceability of social governance. This makes it easier for the public to supervise and participate in social governance, helping to reduce the occurrence of corrupt and fraudulent behaviors, and improving the efficiency and credibility of social governance.

(2) Blockchain technology promotes social participation and democratic decision-making: Blockchain technology provides individuals with the opportunity to directly participate and vote, and based on decentralized autonomous organizations and smart contracts, people can fully participate in the social decision-making process. This makes social governance more democratic and inclusive, which is conducive to achieving comprehensive social development and progress.

(3) Blockchain technology changes power structure and distribution: By building decentralized networks and smart contracts, blockchain technology can change the problems of power concentration and inequality in traditional social governance. Blockchain technology is conducive to achieving fairness and transparency in power distribution, and promoting social justice, democracy, and fairness.

In summary, blockchain technology has great potential in social governance, but its application and development still face many challenges. In the future, we need to continue to pay attention to the innovation and application of blockchain technology in social governance, in order to promote the modernization and progress of social governance. We believe that with the further development of blockchain technology, it will play a crucial role in promoting social justice, democracy, and fairness, and become a key driving force for innovation in social governance. In the future, blockchain technology will be more widely applied in the field of social governance, helping to build a more just, transparent, and democratic society.

References

[1] Li Y , Zhou Y .Research on the Reciprocal Mechanism of Hybrid Governance in Blockchain[J]. 2021.

[2] Meng L , Xing S .Research on the Application of Blockchain Technology in the Field of Corporate Governance[C]//E3S Web of Conferences.EDP Sciences, 2021.DOI:10.1051/E3SCONF/202127501064.

[3] Wan Y , Gao Y , Hu Y .Blockchain application and collaborative innovation in the manufacturing industry: Based on the perspective of social trust[J].Technological Forecasting and Social Change, 2022, 177.

[4] Ahl A , Goto M , Yarime M ,et al.Challenges and opportunities of blockchain energy applications: Interrelatedness among technological, economic, social, environmental, and institutional dimensions[J].Renewable and Sustainable Energy Reviews, 2022, 166.

[5] Tan E , Mahula S , Crompvoets J .Blockchain governance in the public sector: A conceptual framework for public management[J].Government Information Quarterly, 2021.DOI:10.1016/j.giq.2021.101625.