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Construction and Practice of a Multi-Agent Collaborative Mechanism in Grassroots Smart Governance Based on Actor-Network Theory

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Abstract: Under the policy background of digital transformation, the issue of multi-subject collaboration in grassroots smart governance has become the key to improving governance efficiency. This article applies the Actor Network Theory (ANT) and takes the "Quancheng Office" platform in J city as the research object to systematically analyze the construction path and practical effectiveness of its multi-subject collaboration mechanism. Research has found that grassroots smart governance requires the integration of heterogeneous actors through translation, forming a governance network that synergizes technology and institutions. Further research reveals the current practical difficulties and proposes optimization paths, providing a reference for the theory and practice of grassroots smart governance.

Keywords: Actor-network theory; Grassroots smart governance; Multi-stakeholder collaboration

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1. Introduction

With the rapid development of information technology, smart governance has become a key path to enhance the modernization level of grassroots governance. Against the backdrop of the country's strong advocacy for digital transformation and governance innovation, various regions are actively exploring smart governance models. As one of the first batch of smart city pilot cities in China, City J is typical and progressive in smart governance. As a local government service platform, the "Quancheng Office" integrates numerous government service matters, involving multiple departments and entities, and has made active explorations and practices in promoting the collaboration of multiple entities in grassroots smart governance. This study adopts a case analysis method to deeply explore the "Quancheng Office" platform in J city, and uses actor network theory to analyze its multi-subject collaboration mechanism. The relationship, interaction process, and collaboration effect between each subject are analyzed in detail, revealing the essence and laws of the multi-subject collaboration mechanism of grassroots smart governance. At the same time, countermeasures and suggestions are provided for optimizing the

collaboration mechanism of "Quancheng Office" and similar platforms.

2. Literature review

2.1. Exploration and research on the practice of grassroots smart governance

In recent years, foreign countries have made many beneficial explorations in grassroots smart governance. The United States has widely applied technologies such as big data in grassroots governance through the "Smart City" program to improve the efficiency and quality of public services [1]. The Netherlands strengthens information sharing and collaborative governance among regions through the "Digital Delta" plan [2].

Under the promotion of policies, the practice of grassroots smart governance in China has developed rapidly. Wang Yimin emphasized the "urban brain" built by Hangzhou to achieve intelligent and refined urban governance [3]. Chen Shaoqiang pointed out that through the "I Shenzhen" app, government services can be "one-stop" [4]. Cities such as Shanghai and Beijing are also exploring the construction of smart communities and smart streets, using digital means to enhance grassroots governance capabilities [5]. Zhang Lirong believes that in the field of smart government, digital platforms have become an important medium for connecting government departments, enterprises, and the public [6]. Liu Hong believes that in the construction of smart communities, analyzing the network can reveal the power relationships and collaborative barriers between various actors, providing a basis for optimizing community governance [7].

2.2. Research on actor network theory

The theory of actor networks was initially proposed by French sociologist Latour (B.) and has been widely applied in the field of governance research in recent years [8]. Scholars gradually realize the important value of this theory in analyzing the complex relationships among multiple subjects in the governance process. In environmental governance research, ANT is used to analyze the interactive relationships between actors such as government, businesses, social organizations, and the public [9]. Research has found that building heterogeneous actor networks can break down departmental barriers, promote resource sharing and collaborative cooperation, and thus improve environmental governance effectiveness.

3. Theoretical basis

3.1. Actor-network theory (ANT)

The actor network theory was proposed by Bruno Latour, Michel Caron, and John Law, advocating the deconstruction of social phenomena through the dynamic connections and "translation" mechanisms of "heterogeneous actors." This theory uses "mixed ontology" to dissolve the binary opposition between humans and non-human beings, nature and society in traditional sociology, emphasizing that human and non-human actors have equal agency in the network, and their roles are dynamically generated through interactive relationships. The core mechanism of "translation" integrates multiple actors into a common goal network through steps such as problemization, benefit allocation, recruitment, and mobilization, forming a decentralized and dynamically evolving collaborative structure.

3.2. Grassroots intelligent governance

As an innovative form of deep integration between digital governance theory and grassroots governance practice,

grassroots smart governance presents theoretical characteristics that surpass traditional hierarchical systems. This concept was first systematically explained by domestic scholar Tan Chenghua, referring to a new governance model that integrates the governance resources and capabilities of multiple entities such as government, enterprises, social organizations, and the public through technological means such as the Internet of Things, big data, and artificial intelligence, to achieve precise perception, intelligent decision-making, and collaborative action in grassroots public affairs [10].

4. Case background: Innovative governance practices of J City's "Quancheng Office"

"Quancheng Office" is an integrated smart governance platform launched by J City in 2019, which has gone through three stages of development. From 2019 to 2020, as a tool stage, we will focus on the online provision of government services, integrate high-frequency service items, and achieve "one-stop service." From 2021 to 2022, it will enter the platform phase and integrate hotlines and community grid management systems, forming a dual wheel drive of "government services+social governance." From 2023 to present, it is the ecological stage, introducing multiple entities, developing new functions such as "Quancheng Code", and building an open and shared governance ecology. As of 2025, the "Quancheng Office" has integrated more than 2000 application services from 29 departments, with over 5.6 million registered users and an average daily activity of 600000 people, becoming the core hub of grassroots governance in J city.

5. Construction of collaborative mechanism: Analysis of translation process based on ANT

5.1. Problem-oriented: Establishing a mandatory entry point for "technology empowering grassroots governance"

The J municipal government defines "fragmented governance of bureaucratic systems" as the core issue — under the traditional model, departmental data silos lead to delayed response to livelihood issues and scattered channels for public participation. To solve this dilemma, the government has designated "Quancheng Office" as a "mandatory access point" requiring all grassroots governance matters to be accepted, circulated, and receive feedback through the platform, forming a governance paradigm of "unified entry, standardized processes, and centralized data."

5.2. Benefit endowment: Constructing incentive-compatible mechanisms for heterogeneous entities

The platform designs empowerment strategies for different stakeholders interests and demands: the government uses intelligent allocation of work orders and data decision-making to improve efficiency, meeting assessment and innovation needs; The enterprise has obtained value-added services for the development of government data interfaces, with revenue from derivative services exceeding 200 million yuan in 2023; Social organizations obtain project information through platforms and prioritize promotion. By 2024, they will undertake 376 government projects, resulting in a 60% increase in resource acquisition efficiency. The public can enjoy "one-stop" services to reduce costs, participate in governance, and earn rewards such as points. The active participation rate will increase threefold compared to the initial stage in 2023.

5.3. Recruitment: Clarify the role allocation of diverse subjects

The platform clarifies the governance roles of each entity through institutional and technological means: government departments are "rule executors+resource allocators", and need to transmit data, process work orders, and coordinate resources according to standards, such as the Housing and Urban Rural Development Bureau updating the progress of old community renovation in real time; As a "technology solution provider+system maintainer", technology enterprises need to comply with admission standards, ensure data security, and participate in iterations, such as Inspur Group submitting optimization solutions every quarter; The public has the identity of both service users and governance participants, and needs to authorize data and provide feedback on issues. Their rights and obligations are clearly defined in the user agreement; Social organizations serve as "grassroots governance collaborators" and use platforms to connect projects and recruit volunteers.

5.4. Mobilization: Release of network efficiency in dynamic collaborative scenarios

The platform has created a "front-end one window acceptance, back-end classification processing" mode. After the application for enterprise establishment is submitted, it automatically flows to the market supervision, taxation, human resources, and social security departments for parallel approval. The approval time has been reduced from 3 working days to 4 hours. In 2023, a total of 2.13 million business transactions were processed, and cross-departmental collaboration efficiency has been improved by 67%. The synergy between technological systems and institutional rules weaves previously dispersed departmental approval behaviors into a unified network.

6. Real-world dilemma

6.1. Structural lag and imperfect collaborative governance model

Currently, there is a structural lag in the smart governance of J City's "Quancheng Office", and the collaborative governance model among multiple entities has not yet been fully established. The actor network theory emphasizes dynamic translation and interest coordination among multiple subjects, but in reality, the connectivity and interaction among multiple subjects, such as government, enterprises, social organizations, and residents, are weak, and collaborative governance channels are hindered. In the process of promoting the construction of smart cities, although the "Quancheng Office" has integrated some resources, it lacks systematic top-level design and legal guarantees, resulting in the insufficient effectiveness of collaborative governance.

6.2. Insufficient supporting environmental protection

The actor network theory points out that collaborative governance requires a good supporting environment, but J City's "Quancheng Office" faces the problem of relatively lagging environmental protection in the process of smart governance. The data sharing mechanism has not been fully established, and the opening and integration of basic data resources still need to be further promoted.

6.3. Weak interaction among multiple subjects

The lack of interconnectivity and interaction among diverse entities is a major bottleneck in the current smart governance of "Quancheng Office." The actor network theory emphasizes the formation of a symbiotic and evolving actor network through the allocation of benefits and the embedding of responsibilities. However, in reality, the government-led administrative power is disconnected from the grassroots governance model, and the participation of social organizations and residents is low, making it difficult for collaborative governance to form a

joint force.

7. Optimize the path

7.1. Improve collaborative governance structure and build a symbiotic and evolving actor network

According to the ANT, the roles of government, enterprises, social organizations, and residents should be clearly defined to construct a symbiotic and evolving actor network. Specifically, the government should play a leading role in coordinating and coordinating resources from all parties; Enterprises provide technical support and solutions; Social organizations and residents participate in the improvement of smart governance through feedback mechanisms.

7.2. Establish a sound supporting environmental protection mechanism

To address the issue of insufficient environmental protection, it is necessary to strengthen top-level design and improve the legal protection system. At the same time, promote the construction of data sharing mechanisms, break down information silos, and achieve one-time collection and multi-party sharing of data resources.

7.3. Enhance the connectivity and interactivity of diverse subjects

Enhance the connectivity and interaction among diverse subjects through the allocation of benefits and the embedding of responsibilities. The “Quancheng Office” can establish a mechanism for coordinating interests, clarify the rights and obligations of all parties, and enhance the participation enthusiasm of social organizations and residents through incentive measures.

8. Conclusion

This article takes the “Quancheng Office” in J City as the research object and applies Actor-Network Theory (ANT) to systematically explore the construction and practice of a multi-stakeholder collaborative mechanism in grassroots smart governance. The study finds that through translation processes such as problematization to establish mandatory checkpoints, interessement to create incentive compatibility, enrollment to clarify roles, and mobilization to unleash network effectiveness, it is possible to effectively integrate heterogeneous actors, including the government, enterprises, social organizations, and the public, thereby constructing a governance network that synergizes technology and institutions. The operational effectiveness of the “Quancheng Office” also confirms the feasibility of this mechanism. At the same time, the study reveals challenges such as structural lag and insufficient interaction among actors, which need to be addressed through optimizing the collaborative structure and improving safeguard mechanisms. This research can provide a reference for the deepening of grassroots smart governance theory and the construction of similar platform collaborative mechanisms.

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Disclosure statement

The author declares no conflict of interest.

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