

THE SYMBIOTIC RELATIONSHIP AND DYNAMIC BALANCE OF THE FIVE GOVERNANCE ELEMENTS IN THE COMMUNITY GOVERNANCE ECOSYSTEM—A CASE STUDY OF COMMUNITY S IN CITY C

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Abstract: To address the dilemma of fragmented governance elements and inadequate coordination in the modernization of urban community governance, this paper introduces ecological theory into community governance to examine the symbiotic relationships among the five governance elements of “politics, rule of law, moral governance, intelligent governance, and self-governance” within the community governance ecosystem, and proposes a theoretical research framework of “element symbiosis-system balance”. Through an in-depth case study of Community S, this paper verifies that Party-building leadership functions as the “core ecological niche” in the community governance ecosystem. It further reveals the dual mechanisms of complementary symbiosis between politics and intelligent governance, and competitive and cooperative symbiosis between rule of law and moral governance. Additionally, this study demonstrates that intelligent governance technology acts as a key lever to break the inefficient balance of traditional governance. This study provides a theoretical explanation and practical path for addressing the fragmentation of governance elements in urban community governance through the achievement of dynamic balance.

Keywords: Community governance; Party-building leadership; Integration of the five governance elements; Symbiotic relationship; Dynamic balance

1 INTRODUCTION

As a basic unit of the national governance system, community governance has played a key role in promoting the modernization of grass-roots social governance. According to the data of the National Bureau of Statistics in 2024, the permanent urban population in China is 943.5 million, and the urbanization rate has reached 67.00%[1]. Community governance is directly related to the daily life of the town population. In the context of the new era, community governance has faced many challenges, such as the diversification of the population structure and interest demands, and the complication of social contradictions.

In academic research on community governance, the academic community currently focuses on the mechanism construction of community governance under the leadership of gross-root Party building and the summary of practice experience. Chen Donghui, based on the leading attributes and organizational characteristics of grassroots core organizations, systematically demonstrated their leading logic in community governance, and from the perspective of organizational networking, analyzed the operational mechanism of these grassroots organizations in coordinating social resources[2]. Zhang Yi et al. focused on the path of institutional innovation and advocated to improve cross-level collaboration and optimize service supply[3]. Chen Ji put forward that “unified linkage” governance model centered on gross-root Party organization integrating social forces and mobilizing multiple subjects, which provides an institutional innovation path for Party-building to guide residents’ self-governance to break through the dilemmas in urban community governance[4]. Wu Lanbo and Yuan Ke proposed that Party-building-led community should anchor a five-innovation framework of demands, technology, culture, inspiration, and resources by strengthening organizational capabilities. And through the adjustment of relationships among subjects and the nesting of governance goal (neighborhood mutual assistance + residents’ self-governance + co-construction and co-presence), it can promote the generation of a composite governance model[5]. Zhang Xuandi analyzed three-fold constraints faced in improving community self-governance efficiency, constructed the multi-collaborative governance system led by Party building, and cultivated a benign community cultural ecosystem and innovative engagement mechanism, which can effectively activating the vitality of grass-roots self-governance and form promotable experiences[6]. Shi Lufu and Liu Hongde proposed that construction of urban residents’ self-governance building should be driven by the dual cores of Party-building coordination (organization framework and rule system) and the connection between legislation and legal principles, and achieve governance modernization through scientifically meshing self-governance units and activating[7]. Some scholars have also demonstrated the leading role of gross-root Party building in community governance in terms of the activating effect of Party embedding on community self-governance[8], structural adjustment in the process of the sinking of the governance system[9], and the specific employment dimensions and methodologies for Party-building leadership[10]. and in terms of summarizing practical experiences, some scholars have refined innovative practices from governance cases, including the response mode of “gross-root demands -

department linkage”[11], construction plan for a “shared community governance”[12,13], and the mechanism of “Party-building-led integration of five types of governance”[14,15].

The gross-root governance system of “integration of five types of governance” centered on political leadership, legal guarantee, moral cultivation, self-governance as the foundation, and intelligent governance support. And through Party-building leading direction, the rule of law regulating order, moral governance cultivating the folk customs, self-governance activating vitality, and intelligent empowering efficiency, the multi-dimension collaborative governance mode can be formed. Some scholars used related theoretical qualitative analysis to conduct research on how “Five-governance Integration” on promoting urban governance, and demonstrated its advantages in integrating resources and promoting efficiency, meeting the needs of complex modernization governance, constructing a co-construction, co-governance and sharing pattern with multi-party participation, guaranteeing long-term stability with policies, as well as promoting the transformation of modernization of gross-root governance system and capacity. However, the existing studies explore the community governance mechanism from a single dimension: either focusing on the political integration function and value cohesion function of Party-building leadership, or emphasizing its core role in the process of governance modernization, or paying more attention on the empowering effect of intelligent governance technology, but rarely systematically explaining the symbiotic relationships and dynamic balance mechanism among the elements of politics, rule of law, moral governance, self-governance, and intelligent governance[16-18]. At the same time, ecological theory has been innovatively introduced into the field of social governance. Currently, the studies on community governance ecosystem are mainly reflected in two aspects: one is the macro-analysis framework based on social ecosystem theory, emphasizing on multi-level system coupling with less focus on the micro-mechanism of element interaction within the community scale; the other is the mode exploration of “Five-governance Integration” based on democratic practices[19,20]. Based on ecosystem theory, Pang Rong and Wang Miao put forward Party-building leads community governance through environment intervention, systematic integration, and value guidance. And the Shanghai practice coordinates multiple subjects to solve governance problems, providing a reference for megacities[21]. But some elements involved in social ecology, such as symbiotic units, symbiotic relationships, symbiotic energy cycles, have not been deeply integrated into social governance practice. Similarly, based on the collaborative governance model framework proposed by Ansell and Gash, some scholars dedicated to the study on the multi-subject collaborative governance mechanism and optimization paths under the leading of Party-building in urban community governance[22-24]. But much existing research is limited to the description of element function, with the lack of explanation and analysis on symbiotic relationships and dynamic balance[25]. This theory gap leads to the fact that many existing policy tools depend more on static institutional design and are hard to deal with some dynamic challenges including the interweaving of multiple demand and the intensification of resource constraints. Against the background of the national governance modernization and the in-depth promotion of the “co-construction, co-governance and sharing” social governance system, the community governance should break through the dilemma of element fragmentation and low-efficiency coordination.

Community S in City C is the innovative model of gross-root Party building in China, and its “Five-governance Integration” practice provides a vivid example for solving the above problems. This community reshaped the “core ecological niche” of political leadership through reconstructing “four-level Party-building system” and activated the symbiotic chain of moral governance and self-governance through the point-based management rules of the “point management platform”. And it has successfully realized the dynamic adjustment driven by intelligent governance with the help of “intelligent community”. As a result, the community has successfully increased the contradiction resolution rate by 85% and raised the residents' satisfaction rate to 99%. This practice not only verifies the systematic integration efficiency of Party-building leadership, but also further reveals the possibility of the transformation of five-governance elements from “mechanical superposition” to “organic symbiosis”. However, most of existing case reports only stay at the level of experience description, and have failed to explain and analyze its inner logic from the perspective of ecology. Based on this, this paper uses the ecological symbiosis theory as a framework to study how the five governance elements in community ecosystem realized dynamic balance through symbiotic relationships. For the first time, it constructs an “element symbiosis - system balance” analysis model, revealing the synergistic effect of the “energy supply” of Party building leadership and the “information feedback” of intelligent governance technology in breaking the inefficient balance. At the theoretical level, this paper integrates ecology with governance science to make up for the application limitations of social ecosystem theory at community scale. At the practice level, it provides “ecological niche adaptation” strategy for the transformation of old communities and the governance of megacities, contributing to the transforming the institutional advantages of governance modernization into effectiveness.

2 COMMUNITY GOVERNANCE ECOSYSTEM AND GOVERNANCE MODEL

Drawing on ecological theory, the core of community governance ecosystem is to regard community governance as an organic system consisting of five elements, namely, “political governance, legal governance, moral governance, self governance, and intelligent governance. Dynamic balance is realized through the energy flow, material circulation, and information feedback among the five elements.

2.1 Ecological Theories

2.1.1 Symbiosis theory: the ecological logic of element interaction

The symbiosis theory derived from ecology was first proposed by German biologist de Bary in 1879. The theoretical system refers to a three-dimension analytic framework consisting of symbiotic units, symbiotic models, and symbiotic environments. Initially, it's used to explain the mutually beneficial relationships formed by different organisms in nature through material exchange and energy circulation. Professor Hu Shoujun, a Chinese sociologist, first proposed the concept of social symbiosis theory while exploring the transformation issues of Chinese modern society[26]. It provides new dynamic study perspective and methods for understanding, explaining, and analyzing social system[27,28]. In the field of social science, the application scale of symbiosis theory has expanded to the research on the collaborative development of organizations, emphasizing that heterogeneous subjects can achieve system evolution through resource complementarity[29,30]. Regarding the community as a life system with self-organizing ability, the five governance elements in the community ecosystem can form a core symbiotic unit to create a multi-interactive dynamic evolution system, and form a governance community through functional differentiation and collaborative integration.

In the specific community governance practice, five governance elements assume different ecological niches. Political leadership acts as a “producer”, integrating resources of units in the jurisdiction through a four-level Party-building responsibility system to complete the primary transformation of governance energy. For example, the Community S explored the mechanism of “co-location, co-construction, co-discussion, and co-governance” between sub-district communities and Party organizations of resident units, which can integrate the advantage resources, such as talents, intelligence, funding, and service. Legal governance guarantee plays the role of a “decomposer” by formulating regulatory documents such as *Residents' Convention*, *Residents' self-governance charter* to eliminate contradictions and conflicts to maintain the stability of the system. Besides, moral governance and education serve as a cultural gene pool. With the help of “a point-management platform” which encourages residents to participate in community activities such as moral and cultural activities and public service to earn moral points, inherit the community spirit, and cultivate residents' value identity. Moreover, self governance forms self-organization network. Relying on the residents' council and promoting the renovation of old communities, it can realize the circulation and regeneration of governance energy. Finally, intelligent governance constructs a digital neural network. By means of the intelligent platform, it can establish a real-time feedback channel which shortens the response time by 93%. These symbiotic units form a governance ecosystem with self-adaptive ability through symbiotic models such as resource sharing, information exchange and communication, and value transmission in a symbiotic field consisting of community cultures and traditions, technology, and institutional environments. At the same time, maintaining the symbiotic relationship of five governance elements needs a dynamic balance mechanism for the elements. This not only requires maintaining the professional division of labor of each governance element, but also promoting the collaborative symbiosis of these elements through Party-mass joint meeting, the data sharing platform, and other channels.

In the symbiotic evolution process of community governance system, there can be multi-dimensional interactive relationships formed among different governance elements. Among them, the complementary symbiosis and competitive symbiosis constitute the two pillars of the dynamic balance, with the former promoting system efficiency through element coupling, while the latter maintain vitality of ecology with moderate tension. In the dimension of positive synergy, political leadership and intelligent governance support form a symbiotic loop empowered by technology. The grass-root Party organization can obtain various governance parameters such as residents' demands and resource distribution in real-time, and increase the accuracy of service supply by 40% through decision-making model. Moral governance and education and self-governance can form the symbiotic channel of value transformation. For example, the point policy of “point-governance platform” allows residents to exchange 21 services such as priority use of community parking spaces, discounts at the senior canteen, supermarket shopping discounts, and housekeeping services with points earned from good deeds, which can achieve the bidirectional loop between spiritual inspiration and material rewards. This kind of cross-element resource exchange mechanism is essentially a production process of converting cultural capital into governance effectiveness. In the dimension of system balance, the functional game between legal governance guarantee and moral governance and education forms the necessary ecological adjustment mechanism. For example, when there are behavioral disorders such as high-altitude parabolic objects, the legal framework can implement rigid punishment through *Regulations Governing Property Management*, while the moral governance system will organize Red-heart Consultation Meeting and Neighborhood Appraisal Meeting for moral repair. Both form a gradient intervention model in the applicable scenarios. This kind of competitive symbiotic relationship can not only prevent the over-expansion of a single governance method, but also promote policy evolution by eliminating contradictions. The hierarchical processing process of “moral mediation first, legal intervention later” formed by community in practice can shorten the resolution cycle of similar disputes by 35%. However, healthy competition must be maintained within a moderate threshold. When there are disputes over jurisdiction between legal mediation and moral evaluation, the scope of action should be reclassified through coordination mechanisms such as the Party-mass joint meeting, which is exactly the embodiment of the self-adjustment ability of the symbiotic system.

2.1.2 Ecological theory: energy flow and dynamic balance

Ecological theory can provide a dynamic analysis framework for explaining and analyzing the modernization of community governance through the ternary coupling mechanism consisting of energy flow, material circulation, and information feedback. In the field of community governance, political leading constitutes the “primary energy source” of the system, and continuously inputs policy resources and social capital through institutional carriers such as Party-mass joint meeting. Taking community S as an example, the “1+4+N” Party-building alliance system it has constructed integrates the public service resources of 98 enterprises and institutions including hospitals, schools, and companies in the jurisdiction. And it also establishes a volunteer alliance, forming a voluntary service energy flow of

4000 hours per year driving the operation of the governance system. This kind of energy input can not only activate governance subjects, but also complete energy transformation through resource reallocation. During the reallocation process, the grass-root Party organizations convert the administrative authority into community mobilization ability, and transform fiscal appropriations into investment in livelihood projects, constructing an energy transformation chain similar to the “photosynthesis” in ecosystem. Driven by energy, the five governance elements can realize value recreation through material circulation: the rule of law system can solidify the “filial piety and good-neighborliness” principle advocated by moral governance into *Community Dispute Mediation Measures*, which make the moral rules gain institutional constraints; besides, the self-governance mechanism can convert the law-based framework into residents’ deliberation rules, forming the hierarchical progressive transformation of governance elements.

The dynamic balance of the system relies on accurate information feedback regulation. A neural network constructed by intelligent governance technology can collect 12 types of data sources such as the 12345 hotline and grid inspections through intelligent platform, and use machine learning algorithms to identify the five types of important issues including parking shortages and noise nuisance. These information flow can trigger the agenda-setting mechanism of the Party building joint meeting, thereby increasing the problem disposal rate to 92%. During this process, the information feedback can form a bidirectional regulating loop: one is that it revises the governance strategy downward, such as optimizing the meal delivery routes based on the demand data of meal assistance for the elderly living alone, which increases the coverage rate by 35%; the other is that it reshape the system structure upward, such as reconstructing the three-level disposal system of “Legal Mediation Room - Moral Appraisal Hall - Neighborhood Meeting Room” based on the distribution data of types of contractions and disputes. This synergistic effect of energy, material, and information enables the community to have adaptability similar to the natural ecology: when the external environment causes the change of governance energy, the system can realize dynamic balance through elements reshaping (for example, the self-governance force undertakes 60% of material distribution during the epidemic), model innovation (such as developing “Cloud Discussion” program to break through the limitations of time and space), which verifies the core proposition of the ecosystem theory on “steady-state maintenance”.

2.2 Community Governance Ecosystem Model

Different from the social-ecological theory which emphasizes multi-level coupling, this paper focuses on the symbiotic unit relationships among five governance elements, constructing a three-dimension analytic framework of community governance ecosystem of “core ecological niches - functional module - feedback network” (shown in Figure 1), and thereby explaining and constructing the symbiotic relationships and dynamic balance mechanisms of the five governance elements. This framework reveals how each governance element interacts and operates in coordination to achieve the high efficiency and stability of the community governance. The organic unity of “core ecological niches - functional module - feedback network” can optimize the displacement and allocation of five governance elements, thereby maintaining the social governance system at a dynamic balance state.

2.2.1 Core ecological niches: systematic integration function led by Party-building

As the “core species” in community governance ecosystem, Party-building plays the leading role of ecological niche, which can maintain the stability of the system through multi-dimensional functions. In terms of resource coordination, Party-building plays a key role in integrating various resources, including policy resources, social resources, and human resources. For example, it can effectively integrate community service resources through establishing a “Red Steward” team. In terms of organizational guarantee, it provides a solid organizational foundation for community governance through enhancing the organizational capacity and public participation. In terms of rule formulation, the Party-building leadership not only promotes institutional innovation, but also elevates some moral constraints into conventions with legal nature, such as the formulation and implementation of *Community Civilization Convention*. For conflict mediation, Party-building leadership can coordinate the competitive relationships among different governance elements. For example, it can realize dynamic balance in the issue of the application boundaries between the rule of law and the rule of virtue. Finally, in terms of value guidance, the Party-building culture provides directional guarantee for governance actions, making various decisions more in line with public interests. These multi-dimensional functions enable the Party-building leadership a key force to promote other governance elements.

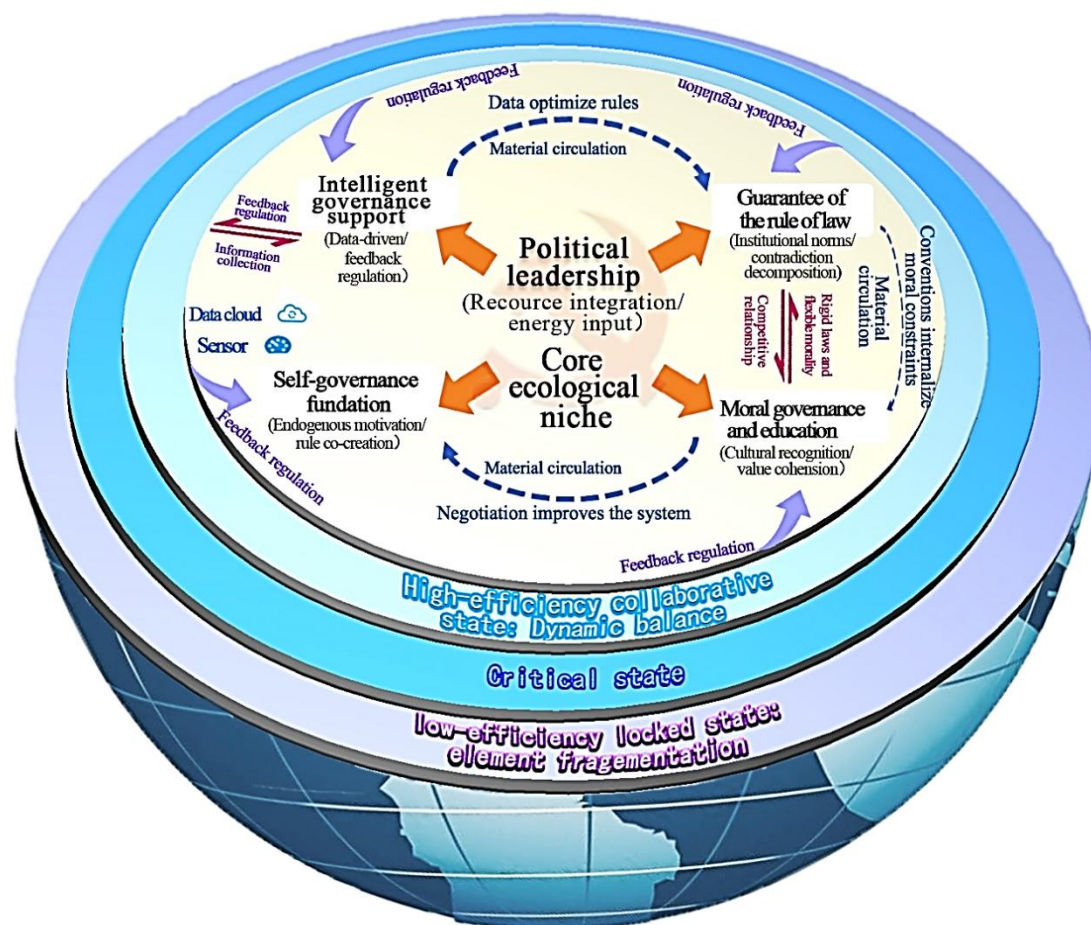


Figure 1 Framework of Community Governance Ecosystem

2.2.2 Functional module: the ecological niche division of five governance elements

For the functional module, the five governance elements have their own functions and complement each other. The first one is the “energy-information” coordination chain between political governance and intelligent governance, and this complementary ecological niche shows that political decision-making relies on the data support and technical backing provided by intelligent governance. The second one is the fundamental ecological niche formed by self-governance and moral governance, and the combination of both provides resilience for the community governance system. The residents enhance their sense of responsibility through participating in decision-making, while moral governance reduces the governance costs through moral identification. Additionally, the restrictive ecological niche of the rule of the law is crucial for maintaining the system order, which defines the behavior boundaries and prevents system from disorder.

2.2.3 Feedback network: the regulating mechanism of dynamic balance

In order to maintain the stable operation of the ecosystem, it is essential to construct an effective feedback network. In terms of positive feedback, it's possible to collect residents' demands in a timely manner and adjust governance strategy through establishing a smooth channel of information communication. For example, the “digital platform” of Community S can shorten the service response time from 8 hours to 30 minutes, which greatly improves residents' sense of gain and satisfaction. At the same time, strengthening the inspiration mechanism to commend the good deeds is beneficial to the formation of good interaction. At the level of negative feedback, it can correct deviant behaviors in a timely manner through constructing a correction mechanism and improving legal guarantee, which contributes to preventing the system imbalance. This bidirectional regulating mechanism can ensure self-optimization and dynamic balance during the governance process.

2.2.4 Threshold effect of system dynamic balance

In the dynamic balance mechanism of social governance, the threshold effect is manifested in maintaining the stability and innovative vitality through the coordinated configuration of key governance elements. In practice, it can be observed that when there is a structural coupling between the in-depth application of intelligent governance technology and the intensity of political leadership, the technology empowerment and organizational mobilization capacity will have an overlapping effect, which can significantly improve the decision-making accuracy and policy penetration of the governance system. However, this balance has the characteristic of dynamic sensitivity. For example, although excessive strengthening of legal norms can enhance institutional rigidity, it may suppress the value-guiding function of the moral governance system, leading to a dual dilemma of the dependence on rules and weakening of moral subjectivity. This imbalance risk shows that when the intensity of institutional constraints exceeds a specific threshold,

it may compress the social self-regulation space and weaken the vitality of flexible governance elements such as cultural identification. Therefore, it's necessary to build a feedback network mechanism to realize dynamic adjustment, such as approximately increasing the weight of moral incentives or accurately adjusting the balance between the political leadership and technology empowerment, thereby maintaining the balanced development of policy ecology. This dynamic governance strategy based on system threshold identification can not only avoid the suppression of innovation ability by rigid institutions, but also relieve the disorder risk caused by fragmentation of flexible governance, ultimately realizing the symbiotic evolution of improving governance efficiency and stimulating social vitality.

3 THE PRACTICE IN COMMUNITY S CITY C

3.1 Characteristics of Community Governance Ecosystem

Community S is located in an old area, with many typical old, dilapidated, and scattered residential communities within it. Its governance ecosystem has once presented two characteristics of “high vulnerability - strong resilience”. And the dilemma is mainly shown as: (1) The proportion of the elderly aged over 60 in the community reached 28%, and the phenomena of empty-nest and living alone are widespread; (2) The fundamental facilities are severely aged, nearly 70% buildings have problems such as pipeline leakage and wall cracking; (3) Market-oriented property management companies have long abandoned the management due to limited profit, and the maintenance of public space has long relied on government support. This low inefficient governance state has led to a high rate of residents' complaints. Facing the systematic governance crisis, the community realized a leap in system resilience through reconstructing the ecological niches. The core path is to construct a “four-level Party-building system”, that is, under the overall coordination of the community Party committee, a three-level organizational network of “Party branch - Party group - Party member center household” is established vertically; and 23 units such as enterprises, merchants, and social organizations in the jurisdiction are linked to form a Party-building joint meeting horizontally. This system embeds the “Red Steward” service team (with Party members accounting for 92%) into grid governance, and thus converts the Party organizations from traditional “policy implementer” to “resource integrator” and “conflict mediator”. For example, in 20022, through the Party building joint meeting, the resources of the district heating company and the municipal department were integrated, and the pipe network renovation of 38 buildings was completed, benefiting more than 1200 residents. Therefore, the Party organizations occupy the “core ecological niche” of the governance ecosystem, which lays a structural foundation for the coordination of the five governance elements.

3.2 Symbiotic Practice of Five Governance Elements

3.2.1 Political leading: resource integration and systematic drive

The Party committee of the community establishes a “resource pool” mechanism through Party building joint meeting. It has cumulatively integrated 420,000 yuan of funds from enterprises in the jurisdiction and approximately 46,000 hours of volunteer service in total, which were allocated to areas such as the renovation of old residential areas and elderly-care services. Taking the pipeline network maintenance as an example, the Party committee coordinated the municipal department, the property management company, and the residents' representatives to sign a *Co-construction Agreement*, classifying the division of responsibilities and cost-share ratio, thereby achieving the sustainable operation and maintenance mode of “a little subsidy from the government, a little concession from the enterprises, and a little contribution from the residents”. The Party building leadership can not only solve practical problems, but also realize the sinking of governance forces through the “Red Grid”. In 2023, the coverage rate of visits by grid managers increased to 100%, and the proactive discovery rate of issues related to people's livelihood jumped from 35% to 82%.

3.2.2 Guarantee of the rule of law: institutional norms and behavior constraints

For high-frequency disputes in the community, such as noise nuisance and pet management, the community proposed the “Three Chiefs” negotiation mechanism (including grid chief, building chief, and unit chief) and formulated the *Community Civilization Conventions* to specify reward and punishment provisions. For example, while dealing with the conflict over square dance noise, the decibel monitoring equipment was introduced and the activity periods were regulated. Those who violate the regulations should participate in community public welfare services. The legal methods enable the resolution rate of conflicts and disputes to increase from 58% in 2018 to 85% in 2023, and the number of legal petitions has decreased by 67%. At the same time, the community established the “Legal Knowledgeable Persons” training program, which has cultivated 36 resident mediators, promoting the rule of law transforming from “external restraints” to “internal norm”.

3.2.3 Moral governance and education: cultural identification and value condensation

The community has implemented a points system to convert voluntary services (such as delivering meals to the elderly and environmental cleaning) into “moral points” that can be exchanged for daily-life services. And the total number of registered volunteers has reached more than 3200, and the point exchange service has been available 12000 times. The typical examples include: a resident, Wang, has gained household management service without charge through points 12 times, and the self-organized “Neighborhood mutual assistance team” has successfully rescued an elderly person living alone who suffered such a heart attack. Additionally, the community established an atmosphere of advocating virtue through “Good People List” and the “Family Virtue Wall”. In 2023, 23 families were selected as moral models, and the residents' recognition of the community culture has increased to 91%.

3.2.4 Self-governance basis: endogenous motivations and co-building of rules

The community constructed various negotiation platforms and attached importance to the self-governance mechanism of “three-meeting”, namely, hearing, coordination meeting, and deliberation meeting, which has successfully solved residents’ concerned issues such as revolution of the community, parking difficulties, and square design. For example, after fully democratic negotiation, the collection rate of monthly 20-yuan residents’ self-governance service fee has reached 100%. And it also innovated “three-down and three-up” negotiation method (publicity and mobilization → collection of opinions → signing and confirmation), promoting the 100% implementation of the residents’ conventions. The self-governance practice not only solves the practical problems, but also cultivates 11 community self-organized organizations, such as calligraphy and painting club and the patrol team. These have formed a governance closed-loop of “joint discussion of affairs - shared responsibility - shared achievements”.

3.2.5 Intelligent governance support: technology empowerment and dynamic adjustment

The community has cooperated with Alibaba Cloud to build the province’s first “digital community” platform, integrating functions such as face recognition access control, intelligent security monitoring, and online discussion halls. The technology empowerment enables the service response time to be reduced from average 8 hours to 30 minutes, which has solved 6070 resident reports. For example, by analyzing the water and electricity usage data of elderly people through AI algorithms, 14 health crisis events have been successfully warned and handled in 2023. Besides, the intelligent governance system has constructed “a demand hotspot map”, automatically pushing high-frequency issues (such as corridor clutter and noise complaints) to the Party-building joint meeting agenda, realizing the transformation from “passive response” to “active governance”.

4 SYMBIOTIC RELATIONSHIPS OF FIVE GOVERNANCE ELEMENTS AND DYNAMIC BALANCE MECHANISM

4.1 Complementary Symbiotic Relationship

Complementary symbiosis is the core mechanism to ensure the high-efficiency operation of community governance ecosystem, presenting as resource complementation and function coordination among five governance elements.

4.1.1 Coordination of political governance and intelligent governance: accurate governance driven by data

Political leadership achieves precise allocation of governance resources and decision-making optimization through the in-depth integration of Party-building data platform and intelligent governance technology. Taking the Community S as an example, the Party committee in the community integrates three types of data: data of units in the jurisdiction, data of residents’ demands, and data of service resources based on the “Digital Party Building” system, and constructed an intelligent matching model of “resource-demand”. For example, during the COVID-19, this platform analyzed the distribution of the elderly living alone through heat maps and coordinated “Red Stewards” team to deliver supplies to 3800 people on a targeted basis with a 100% coverage rate. The coordinate capacity of the political leadership and the analytic capacity of the intelligent governance can form a closed loop of “decision - execution”, increasing the response efficiency to issues related to people’s livelihood by 67%.

4.1.2 Interaction of moral governance and self-governance: the cultivation path of endogenous order

Moral governance and education inspire residents to participate through informal norms, providing a value basis for self-governance practice. In the “point governance platform” in community S, the points system qualifies volunteer services into “moral capital” that can be exchanged for daily life service. A total of over 3,200 volunteers have been registered, and a total of 12000 point exchange services have been conducted. This mechanism activates the endogenous motivation of residents’ self-governance: in 2023, the *Residents’ Convention* formed through “three-down and three-up” negotiation method has maintained a 100% implementation rate for three consecutive years under the incentive of points. The complementarity between moral governance and self-governance is embodied as a chain reaction of “moral recognition → behavior incentive → rule co-creation”, significantly reducing the implementation cost of institutions.

4.2 Competitive Symbiotic Relationship

Competitive symbiosis reflects the function boundary conflicts among five governance elements, which need dynamic adjustment to avoid the imbalance of the system. There are competitions for applicability the rigidity of the rule of law and the flexibility of moral governance in specific scenarios. Taking the noise governance for square dancing, Community S initially depended on moral methods, such as neighborhood persuasion and moral evaluations, but some residents refused to cooperate, leading to a high rate of complaints.

Subsequently, the community introduced the legal tools: install decibel monitoring devices and incorporate them into Community Civilization Convention, which stipulates that those whose activity volume exceeds 55 decibels and those who exceed the time limit should participate in public service of the community. Although this method has significantly reduced the volume of complaints, it also induced criticism from some residents about “indifference in human relationships”. In practice, it was observed that over-reliance on legal measures will lead to the reduction of residents’ moral vitality. This indicates that the rule of law and moral governance needs “proportional adaptation” to maintain the balance. That is, the law sets the bottom line and morality fills the gap.

4.3 Dynamic Balance Mechanism

The determination and adjustment strategies for the balance state of the system can be analyzed from two dimensions: the characteristics of high-synergy are presented as collaborative drive of political governance and intelligent governance, and through “Red Grid + Intelligent Platform”, it can achieve the strong complementarity of the elements, and there is a significant positive feedback between the vitality and self-governance efficiency of moral governance, forming a virtuous cycle. Besides, the characteristics of low-efficiency locked state are that there is a negative correlation between the constraints of the rule of law and the vitality of moral governance. And the competitive disputes dominate and the residents’ satisfaction reduces significantly.

The policy design should adhere to the principle of “niche adoption”: for megacities, the “intelligent governance-dominated” mode can be promoted, emphasizing the development of refined management empowered by technology. The data-driven decision-making capacity can be strengthened by improving the percolation rate of the intelligent governance and refining the coordinate mechanism of “Red Grid - Intelligent Platform”. While for western cities and towns, the “integrated model of moral governance - self-governance” can be implemented, emphasizing the political leading role of the grass-root Party organizations, integrating resources for the rural revitalization strategy, cultivating the self-governance capacity of the community, and promoting the in-depth integration of the construction of rule of law and moral education.

5 EVALUATION OF GOVERNANCE EFFICIENCY AND SYSTEM RESILIENCE

5.1 Qualifying Achievements: Element Coordination and System Balance

The efficiency of the community governance ecosystem can be comprehensively evaluated through the intensity of political leadership and the balance state of the system. In terms of political leadership, Community S can achieve the 100% coverage rate of Party building program through “a four-level Party building system”. In 2023, a total of 48 regional Party-building activities were carried out, and 23 units in the jurisdiction were mobilized to participate in livelihood programs such as the renovation of old residential areas and elderly-care service, with a Party member participation rate of 92%. This high participation rate not only reflects the cohesion of the Party organization, but also shows the integration efficiency of political leadership on governance resources. The Party-building joint meeting coordinates an average of 420000 yuan in funds annually, targeting and resolving 38 issues such as pipeline network maintenance and parking management, benefiting more than 1200 residents.

In terms of system balance, the governance achievements and efficiency are presented by the dual leaps of a 95-point (out of 100) resident satisfaction score in 2023 and a 85% year-on-year decline in conflicts and disputes. The satisfaction investigation shows that residents gave the highest scores to the response speed of “Red Steward” service (30 minutes), and the convenience of points exchanges (with a 92% approval rate). The sharp reduction in conflicts and disputes is attributed to the coordinate mechanism of rule of law and moral governance. For example, disputes such as square dance noise and pet nuisance are resolved at the beginning through Community Civilization Convention, and thus, the proportion of mandatory legal intervention significantly reduces. The investigation data confirm the positive effect of the complementary and symbiotic relationship of the five governance elements on the system stability.

5.2 Resilience Performance: Risk Resistance and Self-Adaptive Adjustment Ability

The resilience of community governance ecosystem is manifested in its risk resistance ability to withstand external shocks and its self-adaptive adjustment ability to deal with internal changes. During COVID-19, Community S established an emergency service system relying on “Red Stewards” team: 63 Party members in the community had provided voluntary services for 2500 hours, and have delivered material supplies to 3800 people. Besides, the daily monitoring coverage rate of the elderly living alone reached 100%. These contributed to achieving the goal of a zero-infection community. This risk-resistance efficiency stems from the rapid mobilization ability to assemble the team within 4 hours under the political leadership and from the information integration capacity to form intelligent governance support by matching demands and resources in real-time through the “Digital Community” platform.

In regular governance, the self-adaptive adjustment capacity is presented as the dynamic response to changes in population structure. Targeting the current situation where the aging rate in Community S is 28%, it has transformed the idle housing into elderly-care stations through “three-down and three-up” negotiation method, providing services such as daily care and health monitoring, with an average daily reception of 45 elderly persons. During this process, the flexibility of the system was highlighted: (1) Demand perception: the intelligent platform monitored that the activities of the elderly groups are concentrated on the square in the community, triggering the generation of the renovation topic. (2) Resource allocation: the Party-building joint meeting coordinates with the municipal department to allocate 200000 yuan, connecting the community health service center to provide medical support. (3) Rule iteration: the Regulations on the Management of the Care Station are revised according to the usage, and a family member reservation system is added, which contributes to the effective improvement of satisfaction.

The path to enhance resilience needs to optimize governance structure through the complementarity of multiple elements. Specifically, the incentive mechanism of moral governance can effectively mobilize the willingness to participate, thereby reducing the over-dependence on a single governance tool and avoiding the problems of system fragility caused by “over-reliance on the rule of law”. This diversified governance method can not only improve governance efficiency, but also enhance the adaptability and stability of the governance system, contributing to the

construction of a modern governance system.

6 CONCLUSION

This study constructed an analytic framework of “core species - functional module - feedback network” by introducing ecological theory, revealing the symbiotic relationships and dynamic balance mechanism of five governance elements in community governance ecosystem. At the theoretical level, it first introduces the concept of “core species” into governance study, verifying the dual functions of political leadership as “energy supplier” and “rule maker”, namely, the political leadership occupies the core ecological niche through integrating resources and driving institutional transformation, while the intelligent governance acts as an “information center” to shorten the feedback cycle, forming a bidirectional enhancement mechanism of “political governance inputting energy - intelligent governance circling information”. This framework breaks through the static limitation of traditional “element superposition theory” and makes up for the application gap of the social-ecological system theory at the community scale. In terms of practice, this paper proposes the differentiated governance strategy of “ecological niche adaptation”: eastern megacities can promote “intelligent governance-driven” mode based on intelligent infrastructure, and achieve conflict prediction and targeted intervention through the data center platform; communities in western region need to strengthen the integration of “moral governance - self-governance”, and activate the endogenous order based on residents’ convention. At the same time, it is necessary to be vigilant against the dilution risk of political authority by technology empowerment. Furthermore, the “Party’s management of algorithms” mechanism needs to be further explored to balance technological rationality and Party-building leadership.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

REFERENCES

- [1] National Bureau of Statistics of China. Statistical Communique on National Economic and Social Development of the People's Republic of China in 2024. 2024. <http://www.stats.gov.cn>.
- [2] Chen DH. Exploration and paths of social governance innovation led by grass-roots Party building. *Theory and Reform*, 2019(03): 181-188.
- [3] Zhang Y, Chen L, Wang YN. Influencing factors of task deviation in grass-roots community organizations under the background of shifting focus downward. *Study and Exploration*, 2020(05): 49-60.
- [4] Chen J. "Integrated linkage": A model of residents' self-governance under the leadership of grass-roots Party building — A case study of community governance innovation in City T. *Administration Reform*, 2022(10): 59-67.
- [5] Wu LB, Yuan K. Practical approaches and institutional changes of community governance led by grass-roots Party building. *Journal of the Party School of Tianjin Committee of the CPC*, 2022, 24(01): 13-22.
- [6] Zhang XD, Liu H. Study on feasible paths to realize residents' self-governance led by Party building — A case analysis of Community H in Shenyang City. *New West*, 2023(04): 74-77.
- [7] Shi LF, Liu HD. Paths of self-governance for urban residents led by Party building and legal guarantees, *Local Practice of Comprehensively Promoting the Rule of Law*. School of Law, Dongbei University of Finance and Economics; Dongbei University of Finance and Economics, 2024: 211-226.
- [8] Liang ZH, Yin JY. Construction of a grass-roots governance community led by Party building from the perspective of embeddedness. *Journal of Jinzhong University*, 2024, 41(04): 8-14.
- [9] Zhu J. Cadres "sink down" to help strengthen grass-roots governance — A survey based on Hanyang District, Wuhan City. *Study Monthly*, 2024(01): 38-41.
- [10] Fu LZ. Exploration on the path of urban community governance led by Party building. *Time Report*, 2024(12): 31-33.
- [11] Wu CL, Bao ZJ. Hierarchical coordination and focus adaptation: Differences in paths to modernization of the grass-roots governance system — A comparative analysis based on two typical cases in Beijing and Zhejiang. *Journal of Northwest A&F University*, 2025, 25(02): 89-97.
- [12] He Q. Study on the construction of a community governance community led by Party building. Jilin University, 2024.
- [13] Miao DL. Practical mechanism of building a grass-roots social governance community led by Party building — A case study of commercial housing community governance. *Seeking Truth*, 2024(01): 169-177.
- [14] Jiang YW, Lv JY. "Three districts" united as one and five governance integrations: Study on the integration of grass-roots united front work into grass-roots governance. *Journal of Huzhou University*, 2025, 47(01): 60-68.
- [15] Chen FX, Zhang H. Five governance integrations, governance mechanisms and municipal governance performance — An empirical survey from Huaibei City. *Journal of Zhejiang Wanli University*, 2024, 37(05): 59-66.
- [16] Tang HF, Xu Z. Mechanism construction and optimization path of urban refined governance led by Party building in the new era. *Inner Mongolia Social Sciences*, 2024, 45(04): 2+62-71.

- [17] Yuan LH. Practical dilemmas and countermeasures of community governance empowered by digital technology. *Housing and Real Estate*, 2023(25): 72-74.
- [18] Gan J, Dai GW, Li JW, et al. Logic, dilemmas and solutions of community governance empowered by digital technology. *Science Technology and Industry*, 2024, 24(11): 130-134.
- [19] Ostrom E. A general framework for analyzing sustainability of social-ecological systems. *Science*, 2009, 325(5939): 419-422.
- [20] Fan YM. Practice and experience of building a community governance ecosystem through "five integrations". *China Social Work Daily*, 2020(002).
- [21] Pang R, Wang M. Path of community governance led by Party building from the perspective of ecological theory. *Chinese Social Sciences Today*, 2024(T06).
- [22] Ansell C, Gash A. Collaborative Governance in Theory and Practice. *Journal of Public Administration Research and Theory*, 2008, 18(4): 543-571.
- [23] Zhao GZ. Study on the optimization path of urban community governance efficiency from the perspective of collaborative governance. *Housing and Real Estate*, 2024(19): 74-76.
- [24] Chen JY. Study on the collaborative governance mechanism of multiple subjects in urban communities under the "Party Building Alliance" in District Y, City M. *Southwest University of Science and Technology*, 2024.
- [25] Yang KF, Qiu NQ, Guo YF. "Integration of three governances": Reshaping contemporary China's grass-roots society and grass-roots governance. *Public Administration and Policy Review*, 2024, 13(01): 3-18.
- [26] Hu SJ. *The Theory of Social Symbiosis*. Shanghai: Fudan University Press, 2012.
- [27] Yang LL. Application of symbiosis theory in the field of social sciences. *Tribune of Social Sciences*, 2010(16): 149-157.
- [28] Gao M. Symbiosis theory: A new idea for the integration of urban and rural public services in regions. *Journal of Southwest Agricultural University*, 2012, 10(04): 16-20.
- [29] Huang X, Han L, Zhao, YH, et al. Theoretical basis and analytical framework of urban social-ecological system research. *Acta Ecologica Sinica*, 2024, 44(15): 6892-6905.
- [30] Jiao WJ, Li YW. A review of social-ecological system framework research: Development trends, research methods and application fields. *Acta Ecologica Sinica*, 2024, 44(20): 8968-8983.