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Research on Integrated Innovation of Urban Community Space Optimization and Governance Enabled by Digital Intelligence

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Abstract: Against the backdrop of the modernization transformation of grassroots governance, urban communities are confronted with practical challenges including the mismatch between supply and demand of spatial resources, inadequate refined public services, and insufficient coordination among governance stakeholders. The rapid advancement of digital and intelligent technologies offers new technical support to break through the bottlenecks in optimizing community space and improving governance efficiency, serving as a critical driver for transforming community governance models. This paper discusses the contemporary requirements and value objectives of the integrated innovation of urban community space optimization and governance. It explores how digital and intelligent technologies empower multiple stakeholders to build a collaborative governance mechanism. Finally, it proposes implementation pathways for the integrated innovation of digitally and intelligently empowered communities, including constructing community data with full-domain perception, developing open and shared application scenarios for spatial governance, and improving multi-party linked community relations and operational guarantee mechanisms.

Keywords: Digital and intelligent empowerment; Community space optimization; Community governance

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1. Introduction

Grassroots society serves as the cornerstone of national governance and social stability. The report to the 19th National Congress of the Communist Party of China proposed strengthening the development of the community governance system, shifting the focus of social governance down to the grassroots level, and "fostering a social governance model based on collaboration, participation, and common interests". The report to the 20th National Congress further clarified the need to "improve the social governance system based on collaboration, participation, and common interests and enhance the efficacy of social governance". It also specified that "improving grassroots governance platforms supported by grid-based management,

refined services and information technology" constitutes an important pathway to boost the performance of grassroots social governance. As a vital carrier of social governance, social spatial governance bears fundamental and functional significance for perfecting the social governance system of collaboration, participation and common interests and elevating governance effectiveness. Therefore, guided by the important philosophy that "the people build cities for the people and cities serve the people", empowering social spatial governance through digital and intelligent transformation to upgrade social governance efficiency represents an important exploration direction in the practice of grassroots social governance.

2. Significance of the integrated development of urban community space optimization and governance

The theoretical significance of the integrated development of urban community space optimization and governance is reflected in the following aspects. First, effective urban community spatial governance and integrated innovation can promote in-depth interdisciplinary integration and theoretical breakthroughs. It breaks the relatively isolated dichotomy between physical space optimization in traditional urban planning research and social spatial governance in grassroots governance and community service domains, and explores an integrated collaborative decision-making mechanism of "space optimization–governance integration". Second, it facilitates the exploration of a three-dimensional interactive governance theory of "space-society-technology" in grassroots social governance. Digital and intelligent technologies are adopted to optimize the physical layout, functional distribution and utilization efficiency of community spaces. Within the triple dimensions of space, community and digital intelligence, this study explores mechanisms for effective public participation and community service delivery models. Third, it contributes to the integrated theoretical innovation of urban grassroots social spatial governance. The community acts as a micro unit of urban governance and a basic living unit for residents. Community space research conducted from the micro perspective of grassroots community governance is more closely linked to grassroots social governance and carries greater academic value compared with macro-level urban planning and management research [1].

The practical significance of the integrated development of urban community space optimization and governance is manifested in the following aspects. First, under the guidance of the people's city philosophy, it helps improve the refined governance of urban communities. Digital platforms can capture residents' genuine demands regarding infrastructure utilization, preferences for community services, and potential safety hazards in daily life, enabling more precise and efficient allocation and deployment of community governance resources. Second, it promotes integrated innovation of grassroots social governance models empowered by digital intelligence. The construction of digital community platforms such as online deliberation halls, digital negotiation platforms and shared service applications explores a new form of community spatial governance integrating online and offline channels, and encourages residents to participate effectively in community public affairs and the management of public spaces. Third, it helps optimize the allocation of community spatial resources and improve the quality of community environments. Investigations into community endowments, the utilization status of existing public community spaces, micro-renewal projects and community governance conditions support targeted efforts to accelerate the construction and governance of various communities, including renovations of old residential compounds, planning of newly built communities, and age-friendly and child-friendly retrofits.

3. Literature review on the integrated development of urban community space optimization and governance

Scholarly research at home and abroad on innovations in community spatial governance mainly focuses on the following dimensions.

First, scholars examine technology-driven spatial sensing and the establishment of adaptive governance mechanisms. For instance, IoT sensors, GIS, mobile phone signaling data, and social media data are deployed to monitor in real time the intensity of community space utilization, pedestrian trajectories, and environmental quality, so as to construct a "dynamic map of spatial effectiveness".

Second, studies center on the formation process of participatory spatial production and the accompanying power restructuring. "Collaborative design" and community workshops enable residents to deeply engage in spatial renewal and reshape the discourse power over the planning of community life.

Third, research addresses the equitable allocation of spatial resources and the construction of resilience-oriented spatial justice. Taking GIS accessibility analysis to identify coverage gaps of schools, hospitals and elderly care facilities as an example, scholars explore effective pathways to optimize the layout of community public service facilities [2].

Fourth, existing literature investigates feasible approaches to building smart community governance platforms empowered by technology. Efforts include developing community digital service platforms for "unified management via one network" and connecting internal community databases and information repositories.

Nevertheless, prior studies mostly adopt macro perspectives such as urban management and urban planning. Research on community spatial governance largely remains confined to the optimization of physical space within cities or communities. Few studies specifically examine the governance functions of community spatial design under an integrated framework of "space optimization – governance integration".

Therefore, rooted in the people-centered development philosophy, this study focuses on "integrated innovation of urban community space optimization and governance enabled by digital intelligence". Drawing on New Urbanism and spatial justice theory, it reconstructs community social networks and spatial mechanisms by optimizing the layout of community facilities, forms a spatial paradigm conducive to neighborhood interactions, and attempts to explore effective pathways for refined urban grassroots social governance from the perspective of digitally and intelligently empowered community spatial governance [3].

4. Connotations of the integrated development of urban community space optimization and governance

4.1. Internal logic of integrated innovation in urban community space optimization and governance empowered by digital intelligence

It attaches importance to the mutually reinforcing relationship between community spatial planning and grassroots governance, and emphasizes full public participation in the whole process of community spatial governance. Resources from small-scale and marginal spaces are fully utilized to reconstruct harmonious emotional and trust relationships among neighbors. A dual consultation and communication mechanism combining "online community mutual aid groups + offline interactive activities in community spaces" is established. Public participation in community spatial renewal and the reconstruction of community social networks are regarded as key approaches to improving the efficiency and quality of community governance.

Through micro-renewal and spatial planning design of community spaces, high-quality and refined development of modern urban communities can be realized.

4.2. Multi-dimensional manifestations of urban community space optimization under digital intelligence empowerment

The connotations of urban community space optimization mainly cover the following dimensions. First, the renovation of typical spatial scenarios. For example, at community entrances, vehicle and pedestrian access sequences can be automatically switched during morning rush hours to ease traffic congestion. The difficulty in managing mobile vendors can be addressed by allowing vendors near the community to apply for time-shared electronic stall permits via QR codes and make reservations in advance through online mini-programs. Second, the renovation of existing facilities for community activities to meet the personalized living service needs of diverse groups. Residents can determine the functions of community activity facilities in a certain period through online voting.

4.3. Mechanism construction for integrated innovation in urban community space optimization and governance empowered by digital intelligence

First, optimize the layout and planning of urban community spaces to build cultural and emotional gathering places. An important goal of urban community spatial governance and the improvement of community service capacity is to reorganize and plan public service spaces in a coordinated manner and foster the cultural atmosphere of community public spaces. Urban communities can focus on residents' daily life at the grassroots level. By optimizing, reorganizing and displaying specific community service spaces, cultural and emotional bonds that closely connect residents can be formed. Meanwhile, digital and intelligent platforms are adopted to identify residents' living needs. In the future, living facilities and cultural scenarios suitable for diverse community groups can be created to enhance community vitality and atmosphere, and provide residents with diversified living services including shopping, catering, medical care, education, culture and entertainment [4].

Building on this, digital-intelligent technology—operating through the practical logic of "Data Perception—Precision Response—Collaborative Governance"—serves as a crucial vehicle linking community physical spaces with the objectives of grassroots governance services. By gaining insights into residents' actual living conditions, communities can capture real-time implicit demands for micro-spaces, thereby providing a scientific, data-driven basis for public service provision. Digital platforms can seamlessly integrate "online communication" with "offline deliberation," expanding residents' spaces for social interaction. Leveraging these platforms helps reconstruct trust and reciprocal relationships within the community, ultimately fostering a more harmonious community.

Second, promote community building through community spatial governance and realize the functional regeneration of idle spaces. Communities can build memory-activated spaces and develop "Memory Museums" in the form of cultural and creative spaces. Combined with VR technology, 3D historical tours can be generated to construct the community "space-social network" and attract residents to participate in cultural inheritance. Meanwhile, various micro-spaces in communities, such as marginal spaces and green land, can be well managed. Supported by the system of social workers and community planners, spatial governance practices including micro-renewal, community gardens, and "one-meter vegetable plots" can be carried out, providing reasonable venues for communicative rationality among grassroots actors, actively promoting the

smart development of community public interaction and ecological spaces. Digital-intelligent technology can deeply activate marginalized interaction spaces for community residents. By utilizing the Internet of Things (IoT) to intelligently regulate the resource utilization efficiency of community public spaces, it enhances the comfort of public space environments. At the same time, by augmenting virtual social scenarios within public spaces, it expands both the scope and frequency of neighborhood interaction, thereby reshaping the spatial environment of an acquaintance society.

Third, accelerate the construction of community solidarity and strengthen emotional interactions among residents. Taking community spatial governance as a carrier, promoting emotional connections among residents and reshaping social networks will be an important goal of future community governance. For instance, digital and intelligent tools can be used to build memory-bearing spaces, health-care spaces and collaborative governance spaces, making community spatial governance an important mechanism for establishing emotional bonds among residents.

Furthermore, spaces empowered by digital technologies have effectively advanced the friendly mutual aid of traditional neighborhoods, creating more dynamic and inclusive community interaction spaces and enhancing residents' enthusiasm and initiative in community participation. Through the seamless integration of online platforms and offline spaces, residents are more willing to engage in community activities, volunteer work, or collective events. For instance, residents can participate in virtual neighborhood watch programs aimed at protecting local public space resources, or be mobilized to join digital storytelling sessions. This effective blend of physical and virtual environments not only facilitates frequent and meaningful interactions among community residents but also helps identify and bridge social interaction differences and conceptual divides among diverse demographic groups. However, it must be acknowledged that a critical factor lies in whether we can effectively address the potential digital divide arising from the application of digital-intelligent technology in community governance, while ensuring the protection of residents' personal data privacy, so that technological interventions genuinely serve to unite and protect community members. Ultimately, such innovative public space practices can foster residents' sense of community belonging, trust, and community identity. Consequently, community governance evolves from merely providing services to residents into a vital process of enhancing their cultural identity, strengthening social cohesion, and improving the collective well-being of the public.

5. Pathways for the integrated development of urban community space optimization and governance

First, under the philosophy of the "People's City", identify the main types of residents' demands for public spaces and the dilemmas in the governance of community public spaces, and fully understand the principal contradictions between grassroots residents' needs, local development and community construction. At present, the governance of public spaces in grassroots communities in China is confronted with practical problems including imbalanced allocation of spatial resources, tokenistic resident participation, and disconnection between spatial functions and daily life. Accordingly, differentiated community spatial governance strategies should be formulated in a targeted manner.

Specifically, by mapping and analyzing relevant residents' spatial behavior data through digital-intelligent technology, a solid scientific basis can be provided for these strategies. By establishing a dynamic feedback mechanism between the evolving needs of residents and the supply of public space services,

community governance can shift from traditional one-dimensional supply approaches to a precision-oriented and professionalized public service delivery model. This transformation ensures that the optimization of community public spaces can not only allocate public resources more precisely but also effectively enhance residents' subjectivity in community participation, enabling the improvement of spatial functions to more precisely serve residents' daily lives and their own authentic living needs, and ultimately embodies the core tenets of the "People's City" philosophy in practical governance, thereby fostering a more harmonious and beautiful urban community.

Second, uphold the people-centered philosophy. Drawing on New Urbanism and spatial justice theory, actively promote localized practical innovations of people-centered spatial governance, and grant residents the rights to design and self-govern their community spaces. Meanwhile, improve and strengthen the mixed-use functions of communities, expand flexible space for residents to utilize community infrastructure, and facilitate the return of residents from instrumental rationality to communicative rationality. This section analyzes key challenges in urban community spatial governance and corresponding effective governance strategies from multiple dimensions: resident demand orientation, community spatial design, reconstruction of flexible community spaces, and spatial empowerment for marginal groups.

Third, implement the principle of "collaboration, participation and common interests" in community spatial governance. Enabled by digital intelligence, a digital community service platform can be established to restructure the order of community interaction and shift community governance space toward human-centered development. The function of the digital community service platform is transformed from a "governance and control tool" in conventional community governance into a "relational medium" for fostering harmonious community relations. Within interactive scenarios integrating virtual and physical spaces, digital and intelligent tools and service platforms activate community physical spaces, and build a functional matching system for residents' daily interactions and rational matching of demands.

Specifically, data platforms can be utilized to more accurately capture the real-time needs of community residents, ensuring that the planning and management of community public spaces is not a top-down, administratively imposed arrangement, but rather originates from the spontaneous participation of residents. This shift facilitates the return from instrumental rationality to communicative rationality in community governance. Regarding community spatial design, digital simulation tools and technologies can enhance residents' anticipation of their living environments, improve the visual simulation of these environments, and incorporate more subjective design elements from community residents. This transforms residents from passive recipients into active creators. In terms of constructing flexible community spaces, intelligent management systems allow for the dynamic allocation of multi-functional areas, enabling continuous adjustments based on specific community activities. Simultaneously, efforts must be strengthened to empower marginalized groups through spatial means, creating more accessible and user-friendly digital interfaces to facilitate use by the elderly and people with disabilities. By doing so, groups such as the elderly, low-income families, children, and people with disabilities are not excluded by the digital divide. By integrating these dimensions, community governance transcends traditional, administratively singular approaches, fostering a more equitable, responsive, and inclusive urban communication space that truly embodies the people-centered philosophy and advances the just design of public spaces. These comprehensive strategies effectively address the prevalent dilemmas of misallocated community resources and insufficient resident participation, optimize community public spaces, and promote sustainable future community development.

Finally, explore effective pathways for the integrated innovation of urban community space optimization and governance empowered by digital intelligence. Current grassroots social spatial governance suffers from a dual disembeddedness: "space optimization decoupled from governance needs" and "governance decisions lacking sound spatial design evidence". Therefore, the essence of the integrated pathway for urban community space optimization under digital intelligence empowerment lies in establishing an interactive mechanism between the "governability of community space" and the "spatialization of governance" under the people-centered philosophy. It actively promotes spatial renovation of typical community scenarios, establishes spatial problem diagnosis systems, and improves the efficiency of community deliberation, offering practical references for urban community space optimization and integrated innovative governance.

Disclosure statement

The author declares no conflict of interest.

References

[1] Liu JY, Ran AB, 2026, Spatial Governance in Community Renewal: A Coupled Analytical Framework of "Space–Property Right–Institution". Journal of Human Settlements in West China, 41(3): 1–7.

[2] Chai YW, Zhou YX, 2000, The Current Status, Mechanisms and Trends of Residential Suburbanization in Dalian City. Journal of Geographical Sciences, 20(2): 127–132.

[3] Gao H, Wang L, 2026, Spatial Production and Practical Mechanism of Community Renewal from the Perspective of Life Governance. Oriental Forum—Journal of Qingdao University (Social Sciences Edition), (3): 73–84.

[4] Lu XC, Zhou CX, 2026, Digital Intelligence Technology Empowering Urban Community Governance: Spatial Production and Restructuring Pathways. Urban Development Studies, 33(3): 48–54.

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