



Research Article

The Democratic Foundation of Resilience Governance: The Institutional Construction of Digital Deliberative Democracy in Community Resilience Governance

Qiancheng Zhou^{1*} , Jie Zhang²

¹*School of Public Administration, Jilin University, Changchun, China*

²*School of Humanities and Social Science, The Chinese University of Hong Kong, Shenzhen, China*

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ABSTRACT

As a digital manifestation of grassroots deliberative democracy, digital deliberative democracy serves as a pivotal institutional framework for strengthening the democratic foundation of community resilience governance, effectively addressing its comprehensive governance needs. Employing qualitative research methods and drawing on theories of deliberative democracy and resilience governance, this study focuses on the institutional development of digital deliberative democracy within community resilience frameworks. Based on criteria such as operational logic, stakeholder composition, functional roles, and governance contexts, community digital deliberative democracy is categorized into three forms: institutionalized procedural digital deliberation, open public digital deliberation, and community-based layered digital deliberation, with systematic analysis of their distinct functions: institutionalized deliberation solidifies the foundational mechanisms of community resilience; open deliberation establishes risk early-prevention systems and public opinion integration mechanisms; while layered deliberation enhances emergency response capabilities and social rehabilitation capacities at the grassroots level. These three approaches collectively form a holistic resilience-enhancing ecosystem. The study proposes a developmental pathway for institutionalizing digital deliberative democracy in community resilience governance across four dimensions: institutional norms, platform integration, participation mechanisms, and sustainable safeguards. This work enriches the theoretical framework of grassroots digital democracy and resilience governance, providing a theoretical reference for advancing grassroots democratic development, optimizing governance structures, and promoting modernized governance practices.

*CORRESPONDING AUTHOR

Qiancheng Zhou; School of Public Administration, Jilin University, Changchun, China; Email: zqc2023@163.com

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1. Introduction

As the fundamental unit of grassroots social governance and the frontline for risk prevention, community resilience directly determines the risk resistance capacity, recovery capability, and sustainable development potential of urban governance systems. In an era characterized by accelerated social transformation, frequent public risks, and increasingly complex governance scenarios, the traditional rigid governance model dominated by administrative control has become inadequate for addressing diverse governance needs—including emergency response to public incidents, conflict resolution at the grassroots level, and resource integration within communities. Resilient governance has thus emerged as the core paradigm for modernizing grassroots governance [1]. Distinct from conventional passive or reactive approaches, resilient governance emphasizes multi-stakeholder participation, routine risk anticipation, and flexible governance mechanisms to establish a closed-loop system encompassing "prevention, response, recovery, and improvement." The enhancement of democratic participation mechanisms forms the foundational basis for strengthening community resilience [2]. With the comprehensive advancement of digital governance and smart community initiatives, digital technologies such as big data, internet, and new media have been deeply integrated into grassroots governance processes, giving rise to digital deliberative democracy—a novel form of democratic practice [3]. This approach breaks down the temporal and spatial constraints, participation barriers, and social stratification inherent in traditional offline deliberations, providing residents with a new pathway for regular, institutionalized, and accessible engagement in community affairs discussions. It has become a vital vehicle for revitalizing grassroots democracy, fostering consensus in governance practices, and enhancing communities' resilience against risks [4]. Within the dual context of modernizing grassroots governance and enhancing governance through digital empowerment, clarifying the intrinsic relationship between digital deliberative democracy and community resilience governance, and establishing a digital deliberative democracy framework tailored to resilience governance needs have become pressing challenges that must be addressed in contemporary grassroots governance.

The academic community has produced substantial research on community resilience governance and digital deliberative democracy, laying a solid foundation for this study. In the field of community resilience governance, existing research primarily focuses on defining its conceptual framework, value rationale, practical challenges, and optimization strategies, with particular emphasis on how technological empowerment, social organizations, and policy mechanisms enhance community resilience—highlighting multi-stakeholder participation as the core element in building resilience [5]. Regarding digital deliberative democracy, scholars have analyzed its conceptual essence, operational models, and advantages, demonstrating how digital technologies facilitate the normalization and popularization of grassroots deliberative processes. Some studies have further examined the practical applications of online deliberations and digital deliberation platforms in community governance contexts [6]. Existing evidence confirms that digital deliberative democracy effectively addresses shortcomings of traditional grassroots deliberation methods, such as low participation rates, inefficiency, and limited reach, providing new support for improving governance quality and efficiency [7]. However, current research still faces significant gaps and limitations that hinder deeper theoretical and practical advancements. First, most studies lack systematic and institutionalized criteria for classifying types of digital deliberative democracy; they primarily rely on fragmented descriptions based on single practical scenarios, failing to establish a unified, scientific classification system that enables precise differentiation of governance values across various forms of digital deliberation. Second, academic discussions predominantly focus on the overall governance role of digital deliberative democracy as a whole, overlooking the distinct institutional functions of different types and lacking an analysis of their applicable contexts and operational mechanisms within the comprehensive framework of community resilience governance [8]. Third, existing research emphasizes

descriptive accounts of practical phenomena over the development of institutional frameworks, concentrating mainly on application outcomes and practical challenges rather than establishing a systematic, actionable institutional framework for digital deliberative democracy aligned with the core needs of community resilience governance [9].

Building upon the aforementioned research context and existing academic gaps, this paper adopts a dual perspective of deliberative democracy and digital empowerment in resilience governance to conduct a systematic study focusing on the core issues of institutional construction for digital deliberative democracy [10]. The central research questions encompass three key dimensions: First, establishing a systematic classification framework for digital deliberative democracy within community governance contexts based on scientific criteria, thereby clarifying the distinctive characteristics and operational mechanisms of different digital deliberative models; Second, conducting an in-depth analysis of the institutional roles played by various forms of digital deliberative democracy in enhancing community resilience governance [11]; Third, addressing current institutional shortcomings in leveraging digital deliberative democracy to strengthen community resilience by proposing institutional pathways tailored to developmental needs, thereby reinforcing democratic foundations for grassroots governance and providing theoretical and practical guidance for improving governance effectiveness and consolidating community resilience.

The idea and framework of this study are illustrated in Figure 1.

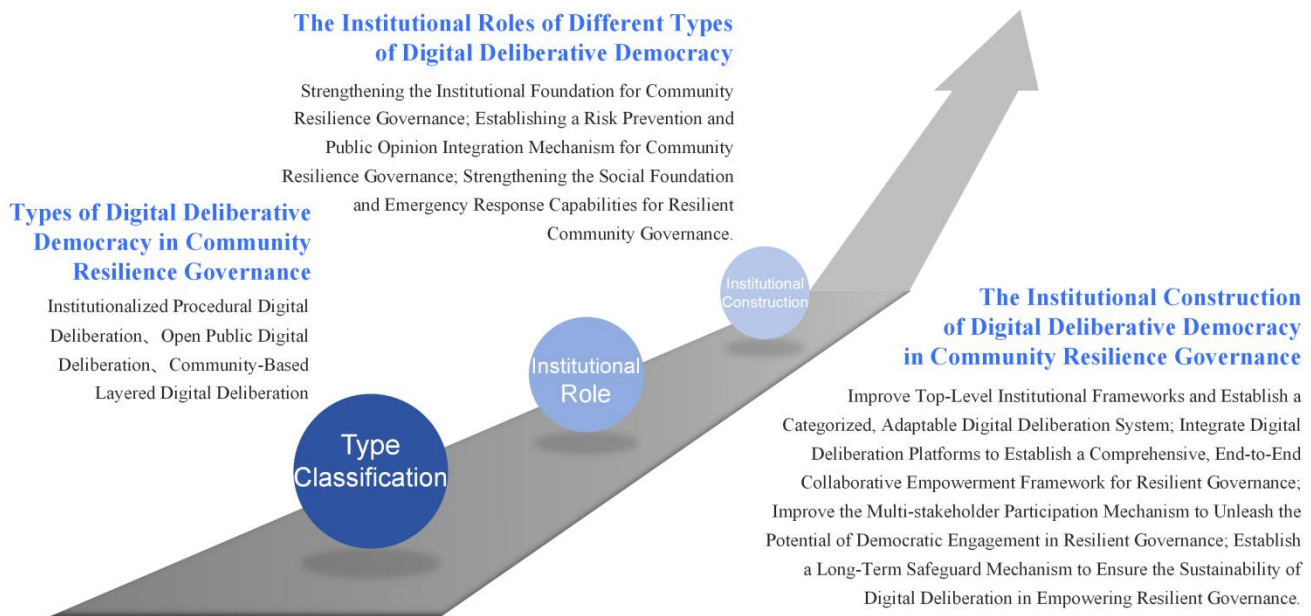


Figure 1. Research ideas and framework diagram.

2. Literature Review

In light of this study's focus, existing literature can be broadly categorized into three areas: research on community resilience governance, studies on digital deliberative democracy, and applications of digital technologies to enhance community resilience governance. These existing findings not only provide theoretical foundations for this study but also reveal substantial potential for further exploration [12].

In the field of community resilience governance research, early academic studies primarily originated from urban risk management and emergency response domains, focusing on enhancing community emergency response capabilities in scenarios such as natural disasters and public health emergencies. Foreign scholars were the first to introduce resilience theory into grassroots governance, proposing that the core of community resilience lies in a

system's capacity to withstand, adapt to, and reconstruct itself in response to external shocks, emphasizing that collaborative participation by multiple stakeholders is key to resilience development [13]. Domestic research, grounded in China's context of grassroots governance, has conducted localized explorations into the connotation, framework, and practical approaches of community resilience governance. Most researchers argue that, compared to traditional rigid control-based governance, community resilience governance places greater emphasis on the elasticity, inclusiveness, and sustainability of governance systems, advocating for leveraging grassroots social forces and improving routine governance mechanisms to address the issues of passive and fragmented risk responses at the local level [14]. Existing studies generally construct a resilience analysis framework from three dimensions: hardware facility resilience, institutional mechanism resilience, and social capital resilience. However, most research tends to focus on macro-level mechanism optimization and technological hardware upgrades, relatively neglecting the foundational supporting role of soft institutional elements such as democratic participation and deliberation mechanisms, and rarely examine the underlying logic of community resilience from a democratic institutional perspective [15].

In the field of digital deliberative democracy research, scholars have produced extensive scholarly work focusing on its conceptual characteristics, practical value, and real-world challenges. Traditional deliberative democracy operates within fixed spatiotemporal frameworks, exhibiting inherent limitations such as high participation barriers, narrow coverage, and elitism. The integration of digital technologies has fundamentally transformed the operational dynamics of grassroots deliberation [16,17]. Current research indicates that digital deliberative democracy leverages platforms like online discussion forums, government social media channels, and community-based digital deliberation groups to overcome the temporal and spatial constraints of offline deliberations, significantly reducing citizens' costs of participating in public affairs while expanding access to grassroots democratic engagement [18]. Numerous empirical studies demonstrate that digital deliberation can rapidly aggregate public opinion, resolve local conflicts, and foster governance consensus, serving as a crucial pathway for institutionalizing and popularizing grassroots deliberative democracy [19]. However, existing research remains notably fragmented: most studies provide only general descriptions of digital deliberation's overall advantages without systematic categorization of its forms, nor do they precisely define the operational mechanisms, applicable contexts, or functional differences among various digital deliberation models—making it challenging to meet the demands of refined grassroots governance research [20,21].

In the field of digital deliberation and community resilience governance, as smart community development advances, scholars have increasingly focused on the empowering role of digital democratic participation in grassroots resilience management [22]. Existing research confirms that regular digital public opinion engagement and online deliberations enhance community risk anticipation capabilities, emergency response efficiency, and consensus-building during post-disaster recovery—serving as crucial foundations for strengthening community resilience. However, current integrated studies exhibit significant limitations [23]: first, research perspectives remain superficial, often confined to descriptive analyses of "how digital technologies improve governance effectiveness" without delving into the institutional mechanisms of digital deliberative democracy; second, research content lacks specificity, failing to differentiate how various forms of digital deliberation uniquely support different aspects of resilience governance and lacking targeted institutional analysis; third, research focuses predominantly on practical solutions rather than systematic institutional frameworks, leaving no comprehensive digital deliberative democracy system tailored to community resilience needs [24,25]. In summary, existing studies inadequately explain the underlying mechanisms through which digital deliberative democracy enhances community resilience governance or provide robust institutional references for sustainable grassroots governance, thereby offering valuable insights for this paper's categorized research, mechanism analysis, and institutional design efforts [26].

Given the limitations of existing research, this paper adopts a dual perspective of deliberative democracy and digital empowerment in governance, focusing on the core issues of institutional construction in digital deliberative democracy and conducts a systematic study.

3. Research Methods and Data Sources

3.1. Research Methods

This study employs a comprehensive qualitative research methodology centered on normative analysis, focusing on categorizing types of digital deliberative democracy, examining institutional functions, and exploring the logical framework for resilient governance development, with particular emphasis on elucidating the intrinsic mechanisms and theoretical connections among key elements. First, the literature review method: A systematic examination of core monographs, journal articles, and academic reports on community resilience governance, digital deliberative democracy, and grassroots digital governance both domestically and internationally was conducted to summarize existing theoretical frameworks, core perspectives, and research limitations, thereby solidifying the study's theoretical foundation and defining its research boundaries and innovative directions. Second, the theoretical deduction approach: Drawing on theories of deliberative democracy, resilience governance, and digital governance, combined with practical contexts of grassroots community governance, this study systematically categorizes forms of digital deliberative democracy and analyzes how each type enhances community resilience governance, establishing a coherent theoretical analytical framework. Third, the qualitative analytical method: Based on real-world governance scenarios and practical implementations of digital deliberative governance, the study identifies institutional shortcomings in current digital deliberative approaches to resilience governance and proposes systematic optimization strategies, ensuring both theoretical rigor and practical applicability of the findings.

3.2. Sources of Data

The research materials in this paper are primarily categorized into two types: theoretical materials and practical policy materials. Firstly, the theoretical materials are sourced from academic databases such as China CNKI, Web of Science, and Duxiu, with a focus on high-quality journal articles, doctoral dissertations, and academic monographs related to grassroots deliberative democracy, resilience governance, and digital governance, providing academic support for theoretical analysis, typological classification, and mechanism elucidation. Secondly, the practical and policy materials encompass relevant policy documents concerning the modernization of grassroots governance at national and local levels, smart community development, and the institutionalization of grassroots deliberation systems. Additionally, they integrate practical cases of digital deliberative governance in typical urban communities across China, local governance work reports, and authoritative media coverage, conducting analyses grounded in real-world practices of grassroots governance to ensure the authenticity, relevance, and practical guidance of the study.

4. Types of Digital Deliberative Democracy in Community Resilience Governance

Current academic classifications of digital deliberative democracy predominantly rely on single-dimensional criteria such as platform platforms, participation formats, or technological architectures, exhibiting issues like fragmented standards, detachment from governance contexts, and neglect of institutional attributes, making them ill-suited for the closed-loop operational logic of community resilience governance. This paper proposes a systematic, institutionalized classification of digital deliberative democracy in community settings based on a unified framework

encompassing four dimensions: institutional operational logic, structure of participating entities, functional positioning of deliberation, and applicable scenarios for resilience governance [27]. First, based on institutional operational logic, distinguish whether deliberation activities rely on official institutionalized processes or spontaneous social mechanisms, thereby defining the institutional characteristics of different deliberation types. Second, using the structure of participating entities as a benchmark, differentiate the weight and interactive relationships among government bodies, neighborhood committees, social organizations, and ordinary residents. Third, focusing on the functional orientation of deliberations, identify whether they prioritize risk anticipation, conflict mediation, emergency response coordination, or long-term collaborative development. Fourth, grounding the analysis in resilience governance contexts, align the framework with full-cycle scenarios of community resilience management to ensure it precisely addresses practical needs at various governance stages. Based on these four-dimensional criteria, this study categorizes digital deliberative democracy in community resilience governance into three core types: institutionalized procedural digital deliberation, open public digital deliberation, and community-based layered digital deliberation.

4.1. Institutionalized Procedural Digital Deliberation

Institutionalized procedural digital deliberation represents a standardized deliberation model established within the official institutional framework of grassroots governance, serving as the core achievement in the digital and institutionalized advancement of community-based deliberative democracy. This deliberation mechanism is primarily led by neighborhood committees, sub-district offices, and grassroots Party organizations, utilizing formal digital platforms such as government service portals, community digital deliberation systems, online hearings, and official government mini-programs [28]. It features fixed deliberation procedures, standardized deliberation rules, and clearly defined authority boundaries. Structurally, it embodies the characteristic of "official leadership with orderly resident participation," where the entire process—including agenda formulation, proposal discussion, voting, and result disclosure—is strictly governed by grassroots deliberation protocols and fully documented for traceability. Functionally, it focuses on critical institutional matters such as establishing community-wide regulations, making major public decisions, upgrading infrastructure, and implementing targeted governance initiatives [29]. This approach aligns with the needs of routine institutional development and sustainable governance in resilient communities, providing a stable institutional framework that serves as the cornerstone for the systematic and standardized evolution of community resilience governance.

4.2. Open Public Digital Deliberation

Public open digital deliberation is an inclusive digital deliberation model accessible to all community residents without strict eligibility requirements, characterized by high openness, public accessibility, and inclusivity. This form of deliberation is not confined to officially designated platforms but primarily operates through open digital channels such as government social media accounts, community public comment sections, online opinion collection platforms, and public forums, overcoming limitations related to identity, social circles, or participant numbers. Various governance stakeholders—including community residents, local businesses, and social organizations—can freely participate and voice their opinions. Structurally, it embodies the principles of "diversity, openness, and equal participation," with official entities mainly performing auxiliary roles in platform maintenance, opinion aggregation, and result feedback rather than dominating the entire deliberation process [30]. Functionally, it focuses on collecting community livelihood concerns, reporting potential risks, gathering public feedback, and addressing governance issues, effectively supporting scenarios for risk prediction, consensus-building, and problem identification in resilient

community governance. This approach comprehensively incorporates grassroots-level governance insights, addresses information gaps in official governance, and enhances the foresight and responsiveness of community management.

4.3. Community-Based Layered Digital Deliberation

Community-based layered digital deliberation represents a spontaneous, fragmented form of digital deliberation rooted in community networks and social circles, serving as the most prevalent and grassroots-oriented approach to governance [31]. This model primarily utilizes private community platforms such as resident groups, building-specific WeChat groups, and neighborhood social forums, with participants mainly consisting of local residents, building managers, and community leaders—a self-organized, participatory informal mechanism. Its structure features "community clustering and neighbor interaction," characterized by geographic proximity and personal familiarity among participants, fostering a flexible and open deliberation environment. Functionally, it addresses micro-level issues including neighborhood dispute resolution, minor public affairs discussions, emergency information sharing, and mutual assistance programs. Well-suited for resilience-driven governance scenarios—such as crisis response, neighborhood reconciliation, and localized micro-governance—it swiftly addresses grassroots needs, activates community capital, and strengthens the social foundation for community resilience.

4.4. Comparison and Summary of Three Types of Digital Deliberative Democracy

To clearly illustrate the differences among the three types of digital consultative democracy, we have prepared a comparative table, as shown in Table 1.

Table 1. Comparison of three types of digital deliberative democracy.

Type	Operational Logic and Institutional Attributes	Key Stakeholders Involved	Main Carrier Platform	Core Functionality Overview	Adapted for Resilience Governance Scenarios
Institutionalized Procedural Digital Deliberation	The system operates in a formalized manner with standardized procedures, clearly defined responsibilities and authorities, and full documentation throughout the process, ensuring strong regulatory compliance.	Street and community Party organizations, neighborhood committees, and resident representatives.	Community digital deliberation platform, government mini-apps, online hearings, and official deliberation system.	Major public policy decisions, improvements to institutional frameworks and regulations, and specialized governance initiatives.	The establishment of routine institutional frameworks and the implementation of long-term, resilient governance mechanisms.
Open Public Digital Deliberation	Operated on a public open basis with no stringent entry requirements and flexible procedures, primarily focused on gathering public feedback.	All community residents, local businesses, and various social organizations.	Government new media platforms, online feedback channels, public discussion forums, and public opinion	Collecting public demands, reporting potential risks and hazards, and gathering public opinions.	Risk prediction and identification; integration of public opinions across all regions.

			collection platforms.		
Community- Based Layered Digital Deliberation	The community operates spontaneously, with interactions within close-knit circles; it is informal, fragmented, and highly flexible.	Neighborhood residents, building managers, and community leaders.	Community WeChat groups, homeowner groups, and neighborhood social communities.	Mediation of neighborhood conflicts, deliberation on minor matters, exchange of emergency information, and mutual assistance among neighbors.	Emergency response mechanisms activation, restoration of grassroots social order, and implementation of micro-governance measures.

5. The Institutional Roles of Different Types of Digital Deliberative Democracy

Community resilience governance constitutes a comprehensive system encompassing end-to-end closed-loop management. Its resilience development relies not only on hardware resources and administrative capacity, but also on a stable institutional framework and democratic mechanisms that foster multi-stakeholder participation. As previously discussed, digital deliberative democracy has been categorized into three types—institutionalized procedural, open public, and community-based network models—based on their operational logic, stakeholder structures, and functional contexts. These three forms of digital deliberative democracy operate under distinct rules and employ different participatory mechanisms, thereby fulfilling differentiated yet complementary institutional functions throughout the entire process of community resilience governance.

5.1. Institutionalized Procedural Digital Deliberation: Strengthening the Institutional Foundation for Community Resilience Governance

Institutionalized procedural digital deliberation possesses standardized, rule-based, and long-term institutional characteristics, serving as the core institutional safeguard for achieving orderly governance and sustainable resilience in community management. It primarily operates at the levels of routine community governance and top-level institutional development, addressing systemic shortcomings of traditional resilience governance such as overemphasis on emergency responses at the expense of institutional frameworks and prioritizing experience over standardized protocols [32]. Firstly, this approach solidifies institutional rules for resilience governance. Through institutionalized processes like online deliberations, digital hearings, and cloud-based voting, the formulation and revision of governance documents—including community risk prevention plans, emergency management systems, public affairs regulations, and neighborhood codes—become transparent and democratic, ensuring that governance designs align with local realities and public needs while avoiding issues arising from unilateral administrative decisions that may lead to impractical or difficult-to-implement policies, thereby providing a stable institutional framework for community resilience enhancement. Secondly, it facilitates coordinated allocation of public resources for resilience governance. In major initiatives such as infrastructure upgrades, public service distribution, and risk prevention facility construction, institutionalized digital deliberations incorporate input from resident representatives, social organizations, and grassroots officials, enabling scientific and rational resource allocation to address deficiencies in both physical infrastructure resilience and public service capacity. Finally, this mechanism ensures the stability and sustainability of resilience governance [33]. Leveraging the advantages of a comprehensive, standardized, transparent, and traceable digital system that leaves full records throughout the process, this approach effectively addresses challenges in grassroots governance such as tailored policies, policy inconsistency, and

fragmented management. It transforms community resilience development from a "phased, campaign-style governance" to a "regularized, institutionalized governance," thereby solidifying the institutional foundation for sustainable community resilience.

5.2. Open Public Digital Deliberation: Establishing a Risk Prevention and Public Opinion Integration Mechanism for Community Resilience Governance

Public Digital Deliberation, characterized by high openness, universal participation, and diversified channels, serves as a pivotal tool for achieving "preventive measures and targeted governance" in community resilience management. It fulfills institutional functions including risk identification, public opinion aggregation, and conflict resolution, effectively addressing governance shortcomings such as information asymmetry and delayed risk perception in traditional grassroots administration. First, it establishes a comprehensive risk prevention mechanism: The open digital platform is accessible to all residents, enabling them to report micro-level issues—including safety hazards, facility malfunctions, potential risks, and governance gaps—through online feedback, public deliberation channels, or community discussion forums [34]. This creates a vast pool of grassroots governance data, shifting risk management from post-event response to proactive anticipation, significantly enhancing community resilience and reinforcing the preventive and forward-looking nature of governance. Second, it achieves precise integration of governance opinions and consensus-building: During policy implementation, targeted initiatives, and livelihood improvement efforts, open digital deliberations widely incorporate diverse stakeholder perspectives, overcoming limitations of traditional elite-based negotiations. This maximizes interest alignment, resolves potential conflicts, lays a solid public foundation for resilient governance measures, and reduces resistance. Third, it establishes a sustained governance oversight mechanism: The transparency of digital deliberations places the entire governance process under resident supervision, compelling stakeholders to promptly address public concerns and improve governance practices, thereby continuously optimizing the community governance system and dynamically elevating overall resilience levels.

5.3. Community-Based Layered Digital Deliberation: Strengthening the Social Foundation and Emergency Response Capabilities for Resilient Community Governance

Community-based layered digital deliberation operates through neighborhood communities and social networks, offering advantages of flexibility, efficiency, grassroots proximity, and rapid response. It serves as a fundamental social institution for enhancing community resilience governance by mobilizing social capital, enabling swift emergency responses, and restoring local social order, particularly in emergency scenarios, micro-governance at the grassroots level, and social rehabilitation contexts [35]. On one hand, such deliberations improve emergency response capabilities: during public crises, disasters, or temporary governance tasks, community platforms like building clusters and resident groups can swiftly disseminate emergency information, issue prevention notices, coordinate resource allocation, and organize mutual assistance—overcoming administrative delays to achieve rapid coordination across community units and establish a multi-tiered response system spanning "streets—communities—buildings—neighborhoods," thereby strengthening community resilience. On the other hand, these deliberations activate grassroots social capital and enhance social resilience: regular online neighborhood discussions, minor matter resolutions, and digital dispute mediation foster closer neighborly relationships, resolve minor conflicts, build consensus, and cultivate a culture of mutual support, trust, and collaborative governance. Post-crisis, community deliberations rapidly restore order and revitalize self-governance mechanisms, facilitating rapid recovery and

continuous improvement while solidifying the social foundation for resilient governance and addressing the shortcomings of traditional rigid approaches that prioritize control over social engagement.

5.4. Comparison and Summary of the Institutional Functions of Different Types of Digital Deliberative Democracy Systems

To clearly illustrate the institutional roles of different types of digital deliberative democracy and conduct a differentiated comparison, this study presents Table 2.

Table 2. Comparison of the institutional functions of digital deliberative democracy.

Types of Digital Deliberative Democracy	Core System Positioning	Main Phase of Action	Specific Institutional Roles	The Beneficial Effects of Resilience Governance
Institutionalized Procedural Digital Deliberation	The foundational support for institutional mechanisms.	The stage of normalized governance and sustained improvement.	Refine the institutional frameworks for enhancing community resilience governance, standardize decision-making on major public affairs, coordinate the allocation of public resources, and ensure that the governance process is standardized, transparent, sustainable, and traceable.	Address the issues of fragmented governance and policy instability, and establish long-term institutional resilience at the community level.
Open Public Digital Deliberation	Risk early warning and public opinion integration.	Daily prevention, management, and rectification phase.	Collect demands and risk information from all residents, establish a proactive risk early-warning system, foster consensus on public governance, and create a sustained mechanism for public oversight.	Enhance community risk anticipation capabilities and governance precision, while strengthening public opinion resilience in governance.
Community-Based Layered Digital Deliberation	Social safety nets and emergency support mechanisms.	Emergency response and post-disaster recovery phase.	Efficiently transmit emergency information, organize neighborhood mutual assistance, mediate minor neighborhood disputes, activate community social capital, and restore grassroots social order.	Enhance the efficiency of community emergency response and social recovery capabilities to strengthen grassroots societal resilience.

6. The Institutional Construction of Digital Deliberative Democracy in Community Resilience Governance

In current grassroots practice, digital deliberative democracy still faces widespread challenges including fragmented institutional norms, ineffective platform operations, superficial participation mechanisms, and inadequate support systems: institutionalized deliberation suffers from overly rigid procedures and insufficient alignment with public opinion; open deliberation encounters difficulties such as disorganized information and low conversion rates of feedback; while community-based deliberation exhibits strong spontaneity, weak standardization, and poor integration into governance frameworks. Therefore, it is essential to adopt the closed-loop logic of resilient governance — "prevention – response – recovery – improvement" — and advance the systematic institutional development of digital deliberative democracy across four dimensions: institutional norms, platform ecosystems, participation mechanisms, and long-term safeguards.

6.1. Improve Top-Level Institutional Frameworks and Establish a Categorized, Adaptable Digital Deliberation System

Institutional standardization serves as the prerequisite for establishing a sustainable framework that enhances resilient governance through digital deliberative democracy. Given the distinct characteristics and functional roles of three types of digital deliberative mechanisms, it is essential to develop tailored institutional rules with tiered regulations to address current shortcomings such as the absence of unified standards and arbitrary operational practices [36]. First, strengthen the binding institutional norms for institutionalized procedural digital deliberation. Leveraging grassroots self-governance systems and local deliberation protocols, clearly define applicable scenarios, procedural workflows, stakeholder responsibilities, and voting mechanisms for community digital deliberations, online hearings, and cloud-based decision-making. Core resilience-related matters—including community risk management plans, public facility upgrades, and major governance decisions—must be mandatorily incorporated into digital deliberation agendas, ensuring that critical governance decisions are "not made without deliberation and not implemented without public disclosure," thereby reinforcing institutional constraints on resilient governance. Second, establish operational guidelines for open public digital deliberation [37]. Develop detailed regulations governing online public opinion collection, risk reporting, and public feedback management, defining a closed-loop process encompassing opinion gathering, classification analysis, task assignment, resolution, and outcome feedback. This addresses issues of information redundancy, mixed demands, and delayed responses in open deliberations, enhancing the institutional efficiency of public opinion integration and risk early warning systems. Finally, address the institutional gaps in community-based layered digital deliberation mechanisms. Integrate community deliberations involving building complexes and resident groups into the standardized system of grassroots self-governance, clearly defining the boundaries of community deliberation, communication protocols, and dispute resolution procedures. This initiative aims to transform spontaneous neighborhood discussions from "disorganized casual conversations" into "structured micro-consultations," while establishing a mechanism for reporting exemplary deliberation outcomes upward to establish institutional pathways linking grassroots micro-consultations with community governance decision-making.

6.2. Integrate Digital Deliberation Platforms to Establish a Comprehensive, End-to-End Collaborative Empowerment Framework for Resilient Governance

Digital platforms serve as the core vehicle for empowering resilient governance through digital deliberative democracy. To address current challenges such as fragmented, isolated, functionally limited, and poorly coordinated deliberation platforms, it is essential to establish an integrated, tiered, and comprehensive digital deliberation platform system that enables complementary interaction and synergistic empowerment among three types of deliberation models. First, leveraging official government platforms as the cornerstone, we will strengthen institutionalized deliberation frameworks by integrating standardized channels like community smart governance platforms, government mini-programs, and online deliberation forums. These platforms will enhance core functions including decision-making deliberations, policy transparency, and resource coordination, focusing on developing sustainable community resilience mechanisms and managing major public affairs to create standardized, professional deliberation platforms. Second, supplementing with public open platforms, we will improve risk-awareness deliberation systems by combining open channels such as government social media, community feedback portals, and public opinion collection platforms [38]. These platforms will optimize risk reporting, complaint submission, and public evaluation features while establishing intelligent classification, rapid dissemination, and timely response

mechanisms for risk information, fully leveraging their comprehensive monitoring and early warning capabilities. Third, building upon community-specific private platforms, we will reinforce grassroots emergency deliberation networks by standardizing operations across residential complexes, neighborhood groups, and property owner communities. Unified standards for information dissemination, emergency communication protocols, and neighborhood deliberation rules will be implemented to establish micro-level emergency response networks, ensuring swift information sharing and collaborative assistance during emergencies. Additionally, a data interoperability and outcome-sharing mechanism will be established across all three platform types to integrate grassroots grievances, public opinions, and major decision-making deliberations, forming a comprehensive digital deliberation ecosystem covering the entire resilience governance lifecycle.

6.3. Improve the Multi-stakeholder Participation Mechanism to Unleash the Potential of Democratic Engagement in Resilient Governance

The sustained engagement of diverse stakeholders forms the core foundation for enhancing community social resilience through digital deliberative democracy. To address current challenges in grassroots digital participation—including uneven participation levels, elitism, passive involvement, and fragmented engagement—it is essential to establish a comprehensive, equitable, and sustained digital deliberation mechanism. On one hand, differentiated participation guidance mechanisms should be optimized: tailored digital skills training programs should be provided for different demographics (elderly, youth, migrant populations) based on their varying proficiency levels; user-friendly interfaces with age-friendly features should be developed to bridge the digital divide and ensure equal participation rights for all residents, thereby achieving full coverage of public opinion in resilient governance [39]. On the other hand, a collaborative participation framework must be established: clearly defining roles for community Party organizations, neighborhood committees, social organizations, resident leaders, and citizens to create a governance model characterized by "Party leadership, committee coordination, organizational collaboration, and broad citizen participation." This approach integrates multiple stakeholders into institutional deliberations and public discussions during routine governance, activates rapid neighborhood response mechanisms during emergencies, harnesses collective wisdom during recovery phases, continuously fosters consensus and social capital for community co-governance, and solidifies the democratic foundation for community resilience.

6.4. Establish a Long-Term Safeguard Mechanism to Ensure the Sustainability of Digital Deliberation in Empowering Resilient Governance

The long-term safeguard system serves as a crucial foundation for digital deliberative democracy to continuously enhance community resilience governance, requiring the establishment of an institutionalized framework encompassing three dimensions: performance evaluation and incentives, supervision and feedback mechanisms, and talent development and technological support. Firstly, implement a performance evaluation system by incorporating participation rates in digital deliberations, resolution rates of public inquiries, risk management efficiency, and conversion rates of deliberation outcomes into grassroots governance assessment metrics. Additionally, establish incentive programs to recognize residents who actively engage in public deliberations, proactively report risks, or participate in neighborhood assistance initiatives, thereby fostering widespread civic engagement [40]. Secondly, improve the closed-loop supervision mechanism by establishing comprehensive monitoring systems that systematically track all opinions, requests, and suggestions generated through digital deliberations, specify processing timelines and responsible parties, and promptly communicate resolution results to residents—ensuring

institutional oversight guarantees the practical implementation of deliberation outcomes and prevents digital deliberations from becoming superficial formalities. Lastly, strengthen technical and talent support mechanisms by continuously upgrading community digital governance infrastructure to ensure stable platform operations, while cultivating specialized grassroots digital governance teams responsible for platform maintenance, public opinion aggregation, deliberation coordination, and outcome analysis. This provides robust technical and human resources support for enabling digital deliberative democracy to consistently and effectively enhance community resilience governance. Through this comprehensive institutional framework, the three components of digital deliberative democracy can fulfill their respective roles synergistically, transforming the advantages of grassroots democratic deliberation into tangible governance capabilities that enable communities to withstand risks, adapt to changes, and achieve iterative improvements.

7. Research Conclusion

First, digital deliberative democracy within the context of community resilience governance is not a singular practice; it can be categorized into three core types based on four dimensions: institutional operational logic, participant structure, deliberative function orientation, and applicable scenarios for resilience governance: institutionalized procedural digital deliberation, open public digital deliberation, and community-based layered digital deliberation. Among these, institutionalized procedural digital deliberation centers on formalized institutional mechanisms and emphasizes long-term system development; open public digital deliberation features inclusive participation and focuses on comprehensive public opinion integration and risk assessment; community-based layered digital deliberation manifests through spontaneous interactions among neighborhood communities and prioritizes grassroots micro-governance and emergency mutual assistance.

Second, different types of digital deliberative democracy serve distinct and institutionalized governance functions throughout the entire cycle of community resilience governance, forming a crucial democratic foundation for fostering comprehensive community resilience. Institutionalized procedural digital deliberation effectively strengthens the institutional framework of community resilience governance, addressing issues such as fragmented grassroots governance, policy instability, and non-standard decision-making processes, thereby establishing long-term institutional resilience. Open public digital deliberation establishes mechanisms for comprehensive risk prevention and public opinion integration, overcoming information gaps and delayed risk perception in grassroots governance while enhancing proactive prevention and targeted governance capabilities. Community-based layered digital deliberation activates endogenous social capital within communities, enhances neighborhood collaboration and social order restoration capacities, and solidifies the social safety net supporting community resilience governance.

Third, to enhance community resilience governance through digital deliberative democracy, it is essential to establish a systematic, hierarchical, and adaptable institutional framework. This involves refining categorized and tiered digital deliberation mechanisms to strengthen institutional foundations; integrating diverse digital deliberation platforms to create comprehensive collaborative platforms for resilience governance throughout its entire lifecycle; improving inclusive and equitable multi-stakeholder participation mechanisms to stimulate grassroots democratic governance momentum; and developing a multidimensional, long-term support system encompassing evaluation, oversight, technology, and talent development to ensure sustainable governance effectiveness.

Author's Contributions

Qiancheng Zhou: Writing – original draft, Writing – review & editing, Conceptualization, Methodology, Investigation, Resources, Supervision. Jie Zhang: Writing – original draft.

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No conflict of interest.

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