



Research on Challenge and Development of Smart Community: Conceptual Background and New Challenges at the Local Level

Xiaotong Lai and Jihaeng Lee^(✉)

Department of Public Administration, Guangdong Ocean University, Mazhang, Zhanjiang, China
1298085774@qq.com

Abstract. At the end of 2019, Covid-19 pandemic swept across the country. As the last line of defense for residents to prevent the epidemic, community is facing huge ordeal and challenges. In the face of the severe epidemic, the smart community has played a pivotal role with the new generation of information technologies such as big data, Internet of Things, AI, cloud computing, block chain, for the epidemic prevention and control. In the meantime, the construction of smart communities also ushered in new challenges. In the post-epidemic age, the development and construction of the smart community has become a trend. By introducing the PSR model into the evaluation index system of community intelligence level and selecting 8 indicators from 3 aspects, namely pressure, state and response, this paper evaluated the level and development degree of smart community construction in China and according to the results of community intelligence evaluation, this paper intends to analyze the realistic difficulties of constructing the smart community and to discuss the ideas of constructing the smart community in the post-epidemic age, so as to improve the informatization and intelligence level of community governance and modernize grassroots governance.

Keywords: Post-epidemic Age · Smart Community · Smart City · Big Data · Community Governance

1 Introduction

At the end of 2019, the COVID-19 epidemic spread throughout the country continuously, and cities have been facing huge challenges about people's livelihood, public health, public infrastructure and so on. As the cell of city, community has ensured community safety and the health of community residents. In order to effectively block the spread of the epidemic, community has controlled staff turnover, avoiding cross-infection and minimizing the risk. Combined with big data, Internet of Things, artificial intelligence, cloud computing and block chains, etc., digital management has been widely applied in community governance for the epidemic prevention and control, improving the efficiency of preventing and controlling the epidemic and pushing the construction of smart community. Hence, this COVID-19 epidemic is both a challenge and an opportunity for constructing smart community. It is the topic this article intends to analyze and discuss

that how to deepen the construction of the smart community, how to build up a modern community that is convenient, safe, comfortable for residents, how to improve the informationization, refinement, intelligence of community governance, thus converting to the modern grassroots governance.

2 Analysis of the Level and Development of Community Intelligence in China Based on PSR Model

2.1 Evaluation Framework

Firstly, the author collected related data and materials of smart community construction in first-tier and second-tier cities. After then the author carried out PSR model analysis by dividing the data into 25 community data in the recent two years. In this paper, the evaluation of smart community construction level shall include pressure system, state system and response system.

Pressure system represents the pressure on smart community management from comprehensive monitoring management and smart community one T-union; The status system represents the status of smart public services, including the richness of community portal services, the rate of establishing residents' health files, and the construction level of smart elderly care in the community; The response indicators refer to smart community government services, including community online service level and intelligent push service, etc.

2.2 Evaluation Model

According to the index system of community intelligence level and the comprehensive evaluation to the smart community construction, the comprehensive evaluation model is as follows:

$$S = 25 \sum_{i=1}^n w_i \cdot x_i \quad (1)$$

In this model, S is the comprehensive evaluation value, x_i is the score value of item i index, w_i is the total ranking weight of item i index (Table 1), n is the number of evaluation factors. In this evaluation system, $n = 8$. According to the comprehensive evaluation value S, community intelligence level can be divided into five grades: preparatory stage (≤ 40), preliminary stage (40–60), basic stage (60–80), medium stage (80–90), and advanced stage (90–100). By introducing PSR model, this paper evaluated the level of community intelligence, established an evaluation model and determined the evaluation indicators, evaluation standards, index weights and evaluation grades based on 8 indicators from 3 aspects of pressure, state and response, which provides reference for quantitative evaluation of the development of smart communities. Based on the analysis results in this chapter, the author discusses the challenges faced by the construction of smart communities in China in the post-epidemic era in the past two years.

Table 1. Evaluation Index System of Community Intelligence Level

Aims (A)	Principles (B)	Fields (C)	Index (D)	Assignment				
				4	3	2	1	0
Evaluation Index System of Community Intelligence Level	Pressure B1	Smart Property Management 0.5	Community Comprehensive Monitoring and Management (D1) 0.500	>90%	80%–90%	60%–80%	40%–60%	<40%
			Smart Community T-Union (D2) 0.500	>90%	40%–60%	60%–80%	80%–90%	<40%
			Community Vehicle Intelligence (D3) 0.364	>90%	80%–90%	60%–80%	40%–60%	<40%
	Status Quo B2	Smart Public Services 0.3	The Richness of Community Portal Services (D4) 0.322	>90%	80%–90%	60%–80%	40%–60%	<40%
			Rate of Establishing Residents' Health Files (D5) 0.467	>90%	80%–90%	60%–80%	40%–60%	<40%
			Community Smart Elderly Care Construction (D6) 0.360	<40%	80%–90%	60%–80%	40%–60%	>90%
	Response B3	Smart Community Government Services 0.75	Community Online Service Level (D7) 0.364	<40%	80%–90%	60%–80%	40%–60%	>90%
			Smart Push Service (D8) 0.264	<40%	80%–90%	60%–80%	40%–60%	>90%

3 The Status Quo of Smart Community in Post-epidemic Age

In order to better prevent and control the epidemic, to adapt to the development of post-epidemic age and to improve the refinement and intelligent level of community epidemic prevention and control, community has gradually realized that it's necessary and imperative to build the smart community. Hence, some districts have begun to actively explore the construction of smart community and some achievements have been made, which to some extent, promotes the accelerated landing and development of smart communities. Take the smart communities in Jiaozhou City in Shandong Province as the example, the community applied the digital technology such as big data, artificial intelligence, and Internet of Things to prevent and control the epidemic. Through intelligent facial

identification, vehicle identification system and 5G thermal imaging, the smart communities in Jiaozhou City contactlessly has measured the body temperature, identify and compare external populations and enhance the management of community personnel access contactlessly [6], providing a basis for the integration of personnel travel during the prevention and control and helping the community manage its personnel and effectively control epidemic. As for the livelihood, the online group purchase platform for community, the Wechat applets and smart robots are included in the community service to meet the needs of community residents. In government service, online community government service platform has been established, realizing one-stop service to meet the needs of residents to deal with their government affairs online [5]. In health care, community health care and smart home provide community resident with high-quality consultation and life services in community during the epidemic. In public facilities, comprehensive and sound service facilities has been prepared, sensing equipment helps construct intelligent security, which builds a 15-min service circle convenient to residents. Build up cultural halls, family parks, group service center of community party, buffet restaurant and other life facilities to form a commercial circle in community that meets residents' needs of life in a small range during the epidemic, establishing a comfortable life service circle that can benefit people [4]. Having considered all-around, a smart community system that matches modern lifestyle will be established to make the fantasy of 'Future Community' come into reality.

4 Challenges of Constructing Smart Community in Post-epidemic Age

For the time being, although the construction of smart communities has achieved certain results and has been contributing to the community during the epidemic, which is convenient for the daily life of residents, it's still facing a series of challenges. The modernization of smart community needs precision improvement.

4.1 Management of Top-Down Inhibits the Enthusiasm of Community Residents

The governance of smart communities is people-oriented and people-oriented governance won't make it without the participation of the public. However, smart community governance in China is still mainly based on top-down ways [13], and thus lack democratic approaches to promote citizens to participate in community governance [3]. Community residents just accept community services passively and they don't have their own voice for community governance. The feedback mechanism is still limited in traditional way such as giving feedback through facial communication or telephone exchange, etc. People's awareness of giving feedback is weak, hindering the democracy of community governance, which is not conducive for residents to forming community identity and belonging. It is urgent to explore a new way of governance for resident to transfer from 'participating passively to 'participating actively'.

4.2 The Problems of Lacking Data Collaboration and Having Data Barriers and Information Silos Still Exist

First, the promotion of smart equipment has promoted the modernization of smart community governance, but since these intelligent equipment belongs to different producers, the information is less associated and its adaptability is not strong, the equipment is stripped, plus with the decentralization of services, it is difficult to unify regulatory supervision. And the collection of data is ‘fragmented’, which constrains the performance of the community integrating the data. Secondly, due to the lack of the top data and affected by the volatility of departmentalism and safety, there is a lack of share of information among superior departments and there lacks an unified and open information platform, which leads to failure of effectively connecting to the community data [11]. Without the department data, the important support of constructing the smart community, it’s inaccessible to fully integrate and manage information resources, which would drag down the efficiency and ability of community services.

4.3 Community Infrastructure Construction and the Application of Intelligent Equipment Lack Pertinence and Effectiveness

According to the relevant survey, only 25% of residents believe that the community basic service facilities meet residents’ needs, 60.5% of residents believe that the facilities can meet their general needs and the remaining 14.5% of residents their needs can’t be satisfied [10] (Fig. 1). This reflects that there is still insufficient investment on infrastructure in some regions and it is difficult to meet the general requirements of people. The construction of the smart community needs to satisfy various needs of community residents, strengthening the investment and construction of infrastructure, improving the utilization and practicability of infrastructure, so that the construction of the smart community can be more user-friendly. The new generation of information technology does play an important role in driving the intelligent operation of the community as well as improving the modernization and informationization of the community, but in the meantime, there are also some problems. Some communities have gone out of the actual requirements when applying smart equipment and data technology, as a result of which, it’s hard for part of the elderly to cross the digital gap and adapt to the lives of smart communities; meanwhile, while smart equipment is widely put into application, the community staff still manage in traditional way and fail to update residents’ information real-time by using big data [8]. They play a limited role in subsequent information analysis and integration, and still needs to consume a lot of human and material resources, resulting in overlapping waste of resources [12].

5 Ideas of Adapting the Construction of Smart Community in the ‘Post-epidemic Age’

According to the status quo of smart community construction, the author takes community resident, government, community worker, and community service provider as the community governance entity, and designs a smart community construction model (Fig. 2).

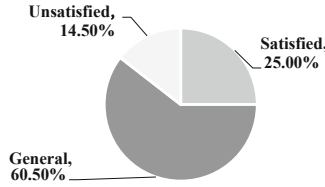


Fig. 1. Results of residents’ satisfaction for community service infrastructure

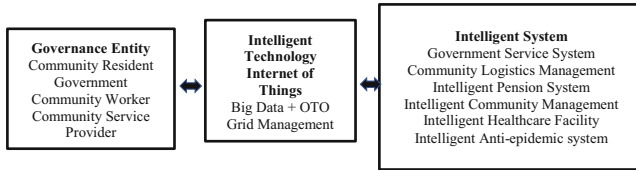


Fig. 2. Smart community concept model

5.1 Top-Level Design Continues to Help Build an Information Sharing Platform and Build a Grid Community Management Platform Based on Block Chain

The construction of smart community is inseparable from the development and utilization of government data and community data. All government departments should open data resources and promote community information construction. Based on the information sharing platform of the city, the block chain technology is used to promote the openness and transparency of data, break the “information soils”, smooth the linkage and sharing of data, form a closed loop of government-community data flow, realize the convergence of data, and facilitate the synergy effect and gain more value of data. Meanwhile, promote the grid construction and management of the community, make the rights go into the community, improve the autonomy of the community. The Third Plenary Session of the 18th Central Committee of the CPC had pointed out to improve the methods of social governance, to innovate social management system, to take the grid management and socialized service as the direction and to establish and complete the comprehensive service management platform at the primary level [9]. By clarifying the governance rights and responsibilities of communities, the full coverage function of data under grid management can be brought into play to eliminate dead zones of community governance and improve the refinement and modernization of community governance.

5.2 Strengthen Data Precision Services and Improve the Construction of New Smart Facilities in Communities

According to the statistics of the demand for community public service projects, except for such daily service as property authority and other services, public facilities, community maintenance, surrounding facilities, life service information, hotline consultation, recreational and sports facilities, garbage classification guidance, residents also have a certain demand for physical monitoring, which reflects that in post-epidemic age, the community residents have begun to pay attention to the health-centered community

demand. When building a smart community, when providing community services, community managers should listen to the voice of the people, pay attention to the sore point of people and target the needs of residents. In the meantime, smart facilities need to be affordable for local conditions, adapt to the needs of different groups of residents, especially for the elderly. For the elderly, aging services must be taken as one standard, so as to improve the inclusive functions and provide a more refined service. For example, since most the elderly do not know how to use electronic devices, when providing smart services, the community can rely on the sound control technology to help the elderly to express and realize what they need in simple language; meanwhile some traditional artificial service projects should be retained to provide convenient community services for the elderly.

5.3 Build an Online Communication Platform for Community Residents to Improve the Participation of Community Residents

During the post-epidemic age, with the anti-epidemic activities and the improvement of the neighborhood relationship during the epidemic, community residents have formed a sense of community identity and trust, which has laid the foundation for the construction of the governance community. According to the statistics of Shanghai Volunteer Service Information, as of December 31, 2020, there are 6,217 communities in Shanghai (including those being prepared) carrying out 87030 volunteer services. The number of people participating in volunteer service has reached 285,067, and the accumulated time of volunteer service is 1,022,459.7 h. This shows that community residents can actively constitute a volunteer group to service community and the governance community has had a very strong pre-foundation. The governance of smart communities adheres to the core concept of people-oriented and need community residents to substantively participate in. Community should build community resident network dialogue platform, through the interacting function of the network platform, provide community residents with ways to participate in community governance, to discuss the construction of smart communities, to express the reasonable appeal of residents, and gradually cultivate community residents ability. Community governance power should be given to people and transfer from the top-down governance model to a new model of multi-participation and corporate governance, strengthening the link among community residents, and improve the happiness and sense of fulfillment of residents. At the same time, it is necessary to clarify the responsibility of the parties, and improve the system mechanism of corporate governance with multi-subjects.

5.4 Innovate the Rational Configuration of Community Resources with the Support of “Big data+OTO”

During the post-epidemic age, community residents gradually adapt to the community group purchase model, and has a certain dependence on community business model, which has greatly increased their wishes of obtaining living necessities from where is close to home. According to the relevant data, by 2020, the number of community group purchased has reached 474 million and the market exceeded 70 billion yuan, and the

market may reach more than 10 billion yuan by 2022 [2]. The development of community group purchases provides new development opportunities for establishing 15-min community portable service circle. Combined with “big data + OTO” information technology, community group purchase integrates community resources for community residents, builds up an online operational platform for community service providers, reduces the cost of residents, meets the needs of community residents to offer home delivery service, and reasonably configures the resources of communities, and provide more comprehensive and accurate community commercial supply services.

5.5 Integrate and Create a Community of Full-Scene with Technology and Data

After the era of the post-epidemic, community governance is more intelligent, and the extensive application of smart equipment has improved the efficiency of community staff, and the ability of epidemic prevention and control. In the face of the obstacle of “information being isolated”, the community can link with the smart equipment of community based on the Internet of Things, so as to integrate big data and construct ecosystem rooted in the smart services in local communities [1]. The application of Internet of Things technology can promptly discover problems through analyzing and integrating data, which is able to provide professional and scientific data support for community services and effectively improves community governance level. For example, through data monitoring of intelligent facial recognition and vehicle identification technology, community personnel flow can be integrated, so as to reasonably arrange human and material resources to conduct community public security management. Moreover, through the data reflected from wearable devices [7], community health can be monitored and community medical resources can be rationally allocated to reduce the medical burden from the aging population. In the meantime, the PPP mode can be applied to provide data support for intelligent equipment developers through the guidance of social capital investment, which can offer a hand to developers of smart equipment who are unfamiliar with community service demand. And PPP mode can also jointly promote the effective landing of smart equipment in the smart community to benefit the community residents.

6 Conclusion

In the era of the post-epidemic, the smart community in China has made achievements and is greatly potential. Promoting the construction of the smart community can effectively improve the modernization of grassroots governance in China, improve the efficiency and governance ability of community governance, reduce the cost of human resources, reasonably optimize the effective configuration of resources, and establish a new pattern of community residents’ collaboration, which is a powerful practice of people-oriented and is also a key and essential step for China’s modernization. In this regard, it is imperative to firmly seize the important opportunity of smart community construction in the post-epidemic era, to further promote the construction of smart community, and to build a new grassroots governance with the new information technology.

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