Research on the Framework and Path of Smart Community Construction Based on ANP-SWOT Model Analysis

Defa Cai and Jiaqian Li(✉)

Harbin University of Commerce, Harbin, Heilongjiang, China
1484524939@qq.com

Abstract. The community is the basic unit of urban residents' life, and the smart community is the basic unit of the smart city. The smart community is the use of new generation information technologies such as 5G, Internet of Things, big data, artificial intelligence, and blockchain, guided by the wisdom, green and human culture of the community, integrate multiple elements such as people, places, things, feelings, and organizations in the community scene, focusing on the public interests of community residents, promote the exchanges and mutual assistance of community residents, coordinating various resources such as public management, public services and business services, provide community management and service applications for governments, real estate, residents, and enterprises, a new model of community management and service that improves the scientific, intelligent, and refined level of community management [1]. It can be seen that smart communities are basic projects that provide residents with precise and refined services, which directly affect the people's sense of security, experience, and acquisition. Through the analysis of the ANP-SWOT model, this paper proposes the overall framework and path dependence of smart community construction.

Keywords: Smart community · ANP-SWOT model · Frame design · Path dependence

1 Introduction

My country's "14th Five-Year Plan" proposes to promote the construction of smart communities, relying on community digital platforms and offline community service agencies to build a smart service circle that benefits the people and provide online and offline community life services that integrate people, community governance and public services,Smart community and other services. In recent years, through the guidance of national policies and continuous innovation in various regions, the construction of smart communities in my country has achieved initial results. Smart communities are an important way to achieve intelligent infrastructure, convenient public services, and precise community governance, and they are also helping to improve grassroots governance capabilities., One of the important means to promote the modernization of the governance capacity of the national governance system is the "last mile" of smart city

A. Luqman et al. (Eds.): PMIS 2022, AHCS 6, pp. 700–709, 2023.
https://doi.org/10.2991/978-94-6463-016-9_71

construction. The construction of smart communities takes government affairs, services, housework and business as the key points and breakthrough points of construction to meet the modern needs of residents' lives and allow residents to enjoy smart services and smart lives. However, in the construction of smart communities, there are still many problems such as lack of overall planning, which urgently need to be studied.

2 Ease Smart Community Construction SWOT Analysis Matrix

Smart community construction SWOT analysis matrix, expert consultation and comprehensive analysis plan to adopt four coping strategies:

2.1 Strengths S

2.1.1 The Overall Policy Environment Continues to Be Positive (S1)

Build a digital China to release more information dividends for the construction of smart communities; A number of characteristic benchmarking areas for new smart cities have been created in various regions, such as the "Digital Longjiang" Development Plan (2019–2025)", which emphasizes the grading and classification of pilot projects for new smart cities.

2.1.2 Excellent Construction Cases Provide Experience Reference (S2)

For example, the construction of a smart community in Luquan District, Shijiazhuang City: Relying on the big data platform, exploring a new grassroots governance model of "perception + intelligence + governance + service", and creating an integrated intelligent governance and service system with a comprehensive sense of collaboration and linkage;Colorful Future Community in Xiaoshan District, Hangzhou: It was selected as one of the first batch of 24 future community pilot construction projects in Zhejiang Province. It is a typical "old community reconstruction and reconstruction" type future community project.

2.2 Weaknesses W

2.2.1 The City's Overall Coordination is Lacking, and the Regional Development is Uneven (W1)

For example, from the perspective of space: Harbin City Nangang District, Daoli District, Songbei District, Pingfang District, etc. advance faster;From the perspective of high-quality technical resource allocation: face recognition systems are mainly concentrated in Nangang District, and Songbei District focuses on the construction of intelligent security systems.

2.2.2 Low Utilization Rate of Smart Facilities (W2)

In the use of infrastructure for smart community construction: the community network electronic payment system is not suitable for the elderly;In the use of the smart community shopping platform: the usage rate is not high, and the number of visits to the community website is not high.

2.2.3 Lack of a Suitable Operating Model (W3)

The main body of smart community construction: The administrative authorities, residents committees, service providers and other stakeholders collaborate to form a long-term operating mechanism of mutual benefit, mutual restraint, and mutual supervision, but the actual effect is not ideal.

2.2.4 Dilemma in Technology Integration (W4)

Diversification of administrative participants: it is difficult to establish a coordination mechanism for resource sharing;Immature technology: It is difficult to combine traditional industries with emerging technologies.

2.3 Opportunity O

2.3.1 The Construction of Smart Communities Continues to Accelerate (O1)

Smart community construction methods: to build a modern smart city in an all-round way with informatization construction as a means and intelligent communities as a construction carrier; Practice of smart community construction: in full progress. For example, in Harbin City, Fushun, Zhaolin, Tongjiang, Aijian and other streets have built "smart community" platforms. Swan Bay in Qunli New District, Xiangfangjiayuan New City, and Nangang Dijing Community Open to use.

2.3.2 Began to Systematically Explore the Management System of Smart Communities (O2)

Management system: For example, the districts and counties of Harbin are systematically exploring the management system of smart communities on a district basis. Daoli District: Establish a management system of "one website: street portal network", "two platforms: online government affairs processing platform, community caring assistance platform", and "three-level linkage" management system.

2.3.3 The Application Field of Smart Community Continues to Expand (O3)

The community has continuously improved the level of intelligence in community services, e-commerce, and property management, and the application fields of smart communities have been continuously expanded. From the digital collection of information, community automation office-public service information, comprehensive social management-refined management and intelligent services, the level of construction of smart communities is steadily improving.

2.3.4 Wide Application of New Generation Information Technology (O4)

In terms of information technology: a new generation of information technology revolutions and the in-depth development of emerging industries change the lives of residents: access control systems such as face recognition systems and vehicle recognition can

strengthen the management of community visitors, unmanned vending machines, shopping applets, community group purchases The platform allows residents to meet their daily needs without leaving the community;In terms of community governance: gradually popularizing the community grid management model based on big data platforms, community governance has entered the "intelligent age".

2.4 Threat T

2.4.1 Lack of Specialized Technical Talents and Management Talents (T1)

Community services and public affairs management require comprehensive management talents; the construction of smart communities requires the operation and management of public information platforms to require professional technical talents.

2.4.2 There is a Risk of User Information Leakage (T2)

The construction of smart communities highly relies on high-tech such as the Internet of Things. Users need to transmit personal information to the Internet, including sensitive information such as ID numbers and bank accounts. In smart applications such as smart home, security, and medical care, the large number of users and the wide range of user information increase the risk of privacy leakage.

2.4.3 Service Fragmentation Has "Information Islands" (T3)

Lack of unified standards: The various stakeholders in the construction of smart communities have launched smart products one after another, and resource sharing and coordination mechanisms are limited and there are "information islands"; Governance methods of government departments: attach importance to vertical governance from top to bottom, ignore horizontal cooperation mechanisms, have less communication between various departments, "information barriers" are common, and the problem of service fragmentation is widespread.

2.4.4 The Community is Diverse, and the Common Needs Need to Be Further Clarified (T4)

The construction of smart communities has its own characteristics, and it is necessary to find the greatest common divisor of the different needs of the community and to meet the individual needs of different groups as much as possible.

2.5 SO Strategy

Use policy advantages to improve the management system of smart communities; learn from outstanding cases to expand the application areas of smart communities; accelerate the construction of smart communities and improve the level of community intelligence; strengthen the innovative application of new generation information technology.

2.6 ST Strategy

Strengthen policy support, establish a smart community talent guarantee mechanism; learn successful experiences, and clarify the common needs of diverse communities.

2.7 WT Strategy

The government strengthens the top-level design, improves the smart service evaluation system; strengthens the application of technology integration, and attaches importance to data security and personal information protection.

2.8 WO Strategy

Give full play to the role of social forces, innovate and build operating models; strengthen infrastructure construction, and build an information service platform.

3 Analysis of ANP-SWOT Model of Smart Community Construction

The construction of a smart community is a comprehensive and systematic project, so the ANP-SWOT model fully considers the influence of various factors, which is more systematic and accurate. Due to the complex calculation of Anp, this article can effectively solve it by using SuperDecision software. The main decision-making steps of the model are as follows:

3.1 Build Model

Use the SWOT analysis method to systematically analyze the influencing factors in the construction of smart communities, and build models in the software Fig. 1:

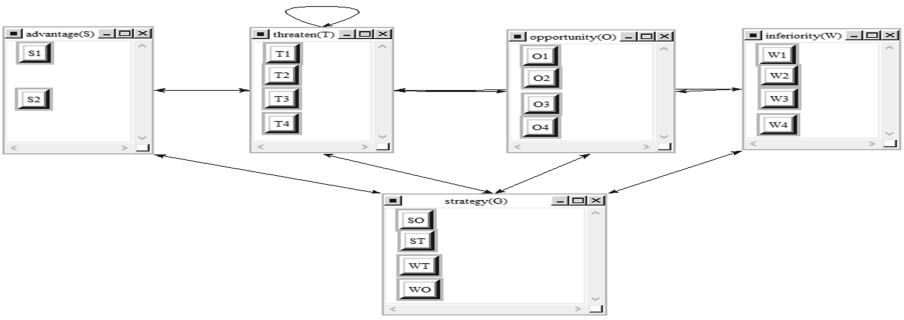

Fig. 1. ANP-SWOT model of smart community construction

3.2 Scoring by Experts

Experts are invited to use the 1–9 scale method to score various factors of smart community construction; the scoring uses the following principles. See Table 1:

The judgment matrix must undergo a consistency test, and the consistency test formula is:

$$CI = \frac{\lambda max - n}{n - 1} \tag{1}$$

$$CR = \frac{CI}{RI} \tag{2}$$

Among them: λmax is the maximum eigenvalue, n is the order of the judgment matrix, CI is the consistency index of the judgment matrix, and RI is the average random consistency index (see Table 1). The average random consistency index is determined according to the order of the judgment matrix. When CR ≤ 0. 10, the consistency of the judgment matrix is considered to be good, otherwise it needs to be adjusted [2].

3.3 Consistency Check

Invite experts to score in the system, and the system will automatically perform a consistency check to avoid unreasonable scoring by experts. The judgment matrix scoring and consistency check in the software are shown in Fig. 2:

3.4 Build the Matrix

Invite experts to score in the system, and the system will automatically perform a consistency check to avoid unreasonable scoring by experts. The super matrix after weighting calculated by software is shown in Table 2:

Table 1. The meaning of 1–9 scale

Scaling(Aij)	Meaning
1	Compared with the two elements, they are of equal importance.
3	Compared with the two elements, the former is slightly more important than the latter.
5	Compared with the two elements, the former is obviously more important than the latter.
7	Compared with the two elements, the former is more important than the latter.
9	Compared with the two elements, the former is extremely important than the latter.
2, 4, 6, 8	Represents the intermediate value of the above adjacent judgment.

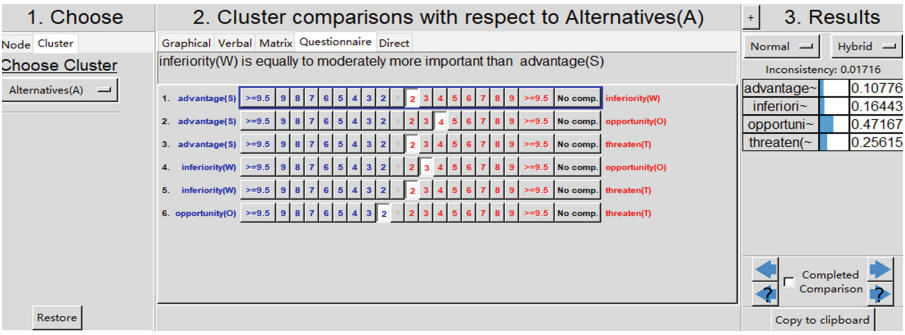

Fig. 2. Judgment matrix

Table 2. The super matrix after weighting is calculated by softwar

	SO	ST	WO	WT	S1	S2	W1	W2	W3	W4	O1	O2	O3	O4	T1	T2	T3	T4
S0	0	0	0	0	0.424	0.372	0	0	0	0	0.629	0.518	0.629	0.389	0	0	0	0
ST	0	0	0	0	0.212	0.186	0	0	0	0	0	0	0	0	0.103	0.103	0.138	0.177
WO	0	0	0	0	0	0	0. 21	0.167	0.174	0. 1	0. 21	0.173	0. 21	0. 13	0	0	0	0
WT	0	0	0	0	0	0	0. 63	0.833	0.522	0. 5	0	0	0	0	0. 31	0. 31	0.276	0.532
S1	0.139	0.222	0	0	0	0	0	0	0	0	0.121	0.099	0.107	0	0	0	0	0
S2	0.046	0.074	0	0	0	0	0	0	0	0	0. 04	0.033	0.054	0	0	0	0	0.114
W1	0	0	0.083	0.072	0	0	0	0	0	0	0	0	0	0	0	0	0.077	0.177
W2	0	0	0.027	0.045	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W3	0	0	0.106	0.179	0	0	0	0	0	0	0	0.177	0	0	0	0	0	0
W4	0	0	0.043	0.094	0	0	0	0	0	0	0	0	0	0.133	0.103	0.103	0.026	0
O1	0.172	0	0.125	0	0.113	0.099	0	0	0	0	0	0	0	0	0	0	0	0
O2	0.089	0	0.088	0	0.071	0.063	0	0	0.304	0	0	0	0	0	0	0	0	0
O3	0.219	0	0.193	0	0. 18	0.158	0	0	0	0	0	0	0	0	0	0	0	0
O4	0.334	0	0.335	0	0	0	0	0	0	0. 3	0	0	0	0	0.293	0.293	0.293	0
T1	0	0.095	0	0.103	0	0	0	0	0	0	0	0	0	0.108	0	0. 19	0. 19	0
T2	0	0.113	0	0.072	0	0	0	0	0	0	0	0	0	0.068	0.063	0	0	0
T3	0	0. 18	0	0.159	0	0	0.053	0	0	0. 1	0	0	0	0.172	0.126	0	0	0
T4	0	0.315	0	0.275	0	0.122	0.107	0	0	0	0	0	0	0	0	0	0	0

3.5 Determine the Weight

The comprehensive weights of the determined indicators are shown in Table 3:

It can be seen from Table 3 that the weight of "SO" is 0. 401646, the weight of "ST strategy" is 0. 100994, the weight of "WO strategy" is 0. 158242, and the weight of "WT strategy" is 0. 339118. Therefore, it is recommended to adopt the SO strategy.

4 The Overall Framework of Smart Community Construction

The construction of a smart community is not an isolated point, but is closely connected with the smart city, and the overall coordinated development is the development and inheritance of the smart city. Therefore, in the process of building a smart community, it

Table 3. Determining the comprehensive weight of indicators

Name	Ideals	Normals	Raw
SO	1	0. 401646	0. 153799
ST	0. 251449	0. 100994	0. 038673
WO	0. 393984	0. 158242	0. 060595
WT	0. 844319	0. 339118	0. 129856

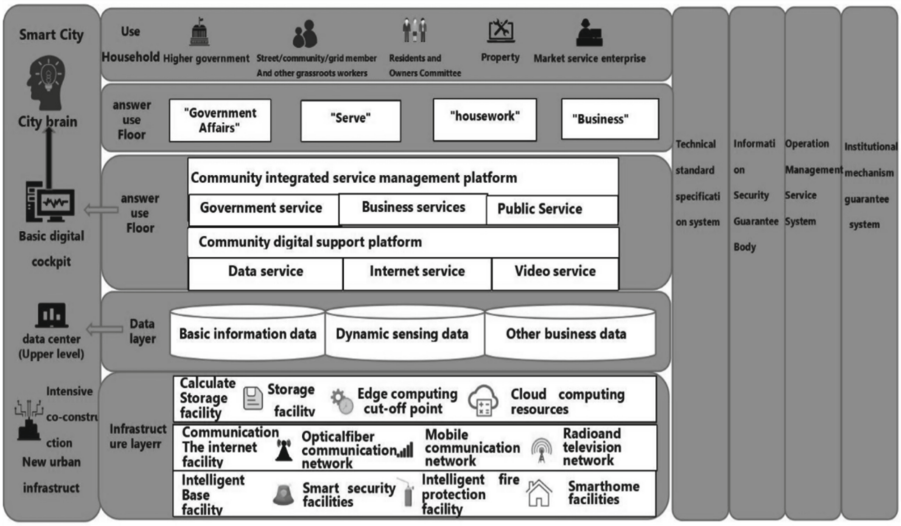

Fig. 3. Overall Framework of Smart Community Construction

is necessary to meet the basic requirements of a smart city while meeting the technical route of community building. The overall framework of the smart community is shown in Fig. 3, which mainly includes four parts: the infrastructure layer, the data layer, the platform layer, and the application layer. The facilities, data, systems, and platforms of the smart community are connected with the corresponding components of the smart city. The smart community The realization of the technical design of the company is guaranteed by the relevant system, technology, operation and maintenance, safety and other standard systems. Its overall structure is shown in Fig. 3:

5 Conclusion

The above analysis concludes that the SO strategy for building a smart community is as follows:

5.1 Use Policy Advantages to Improve the Smart Community Management System

Improve the policy system of smart communities, and clarify the principles, directions, ideas and assessment requirements of smart community construction. At the same time, promote the standardized construction of smart communities, improve the management system of smart communities, formulate industry standards that meet actual needs, unify data interfaces, unify construction content, unify evaluation indicators, and promote the standardization and standardization of community information infrastructure and public services.

5.2 Learn from Outstanding Cases and Expand the Application Areas of Smart Communities

In terms of government affairs construction, speed up the construction of smart government affairs, smart party building, smart security, smart fire protection, smart ladder control, network information management, and smart community corrections. In terms of services, strengthen the construction of services such as smart property, smart medical and health, smart parking, and smart vehicle energy use. In business, accelerate the application of smart express cabinets, digital life convenience circles, garbage collection and classification, and shared venues. In the construction of household chores, it focuses on the expansion of application fields in smart home, housekeeping services, neighborhood communication, smart energy saving, and home care.

5.3 Speed up the Construction of Smart Communities and Improve the Level of Smart Communities

The first is to improve the intelligence level of community managers, realize management professionalism, and strengthen the construction of talent teams. Through the introduction of policies, attract high-end technology development, information system operation and maintenance talents. The second is that for grassroots community workers who do not have strong management and skills, they can only organize training for community business. The third is to expand the publicity and promotion methods of the smart community.

5.4 Strengthen the Innovative Application of New Generation Information Technology

The first is to make every effort to promote the optimization and upgrading of community information infrastructure, and continue to promote informatization in accordance with the overall planning and construction standards for smart community construction. The second is to expand only the application of system service functions. The third is to strengthen the security management of community data. The government and technology companies should work together to build a big data information security guarantee mechanism and promote the optimization and innovation of information security protection technology.

References

1. Released by the National Information Center (2021) smart community construction and operation guide. China Property Management, vol 13
2. Li MZ, Yang YX (2021) Research on the development of smart community in changchun city based on ANP-SWOT model. Smart Build Smart Cities 34:37+43
3. Qi BK, Liu ZX (2019) Shenyang smart city construction plan based on ANP-SWOT model. J Shenyang Jianzhu Univ (Soc Sci Ed) 21:148–154
4. Zhu Y, Han Y (2020) My country's smart community construction and its optimization countermeasures. Leadership Sci 02:122–124
5. Wu XH (2020) How is the construction of a smart community possible?—Analysis based on an integrated action framework. J Public Manag 17:110–125+173