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Research on Smart Community Management in the Era of Internet Plus +



Abstract: - As more and more attention has been paid to community governance, how to ensure the safety and comfort of residents' lives and enhance the level of public participation by improving the intelligence of the community has become a hot issue. The traditional smart community operation management theory only considers a few interest subjects but does not pay attention to multi-interest subjects, and most studies do not involve the Internet Plus relationship of multi-interest subjects. Based on this, the main elements of smart community operation are identified from the perspective of "demand-supply-regulation" of community smart operation, the interest subjects of smart community operation are investigated in depth, the relationship matrix is constructed and the social Internet Plus structure diagram is drawn. Besides, UCINET 6.0 software is employed to analyze the density, centrality and influence of Internet Plus, identify the key factors, and put forward multi-dimensional policy suggestions, thus providing theoretical support for the coordinated development of the smart community with multi-party participation..

Keywords: Smart community; Social Internet Plus analysis; Multi-party participation.

I. INTRODUCTION

For the past few years, as an extension of the research and practice of smart cities, smart communities have been paid extensive attention to by all walks of life. As the stage with the longest duration and the most resource consumption in the whole life cycle of the community, the operation of smart communities has become a research hotspot of scholars at home and abroad, which mainly involves information technology, residents' behavior and community governance.

There are three problems to be solved in the operation of smart communities: (1) the relative isolation between people and people, people and communities hinders the development of smart communities to varying degrees, and there is an urgent need to reasonably analyze and position the participants in the operation of smart communities; (2) The traditional smart community operation management theory only considers a few interest subjects without paying attention to multi-interest subjects; (3) Usually, there are different degrees of correlation between different subjects, and most studies have not yet involved the relationship between multi-interest subjects. To address the above problems, in this paper, the main elements of smart community operation from the perspective of "demand-supply-regulation" are identified, the interest subjects of smart community operation are investigated in depth, the relationship matrix is constructed, and the social Internet Plus structure diagram is drawn. Combined with the social Internet Plus analysis method (SNA), the density, centrality and influence of Internet Plus are analyzed by UCINET 6.0 software, the key subjects are identified, and multi-dimensional policy suggestions are put forward to provide theoretical support for the coordinated development of smart communities with multi-party participation..

II. ANALYSIS OF INTEREST SUBJECTS

Smart communities aim to use a new generation of information technologies such as mobile Internet Plus, Internet of Things, cloud computing, big data and artificial intelligence in the data age to form a community management model based on informatization and intelligence by integrating existing community service resources. It is a community management and service innovation model supported by modern science and technology and can provide community residents with convenient and intelligent living, production environment and services^[2, 6]. There are some significant differences between smart communities and general communities. System integrators and some smart service providers have been added to their interest subjects, and they have five characteristics^[10]: information infrastructure Internet Plus, life service facilitation, community management and public service informationization, community management intelligence, and home management intelligence. The operation of smart communities involves multiple interest subjects. The internal participants include residents, property companies, and owners' committees. The external participants include governments, real estate developers, system integrators, service providers, and telecom operators. Various subject members are

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linked together through business such as supervision, service, collection and payment, and provision of information to form a community of interests for the operation of smart communities (Figure 1)

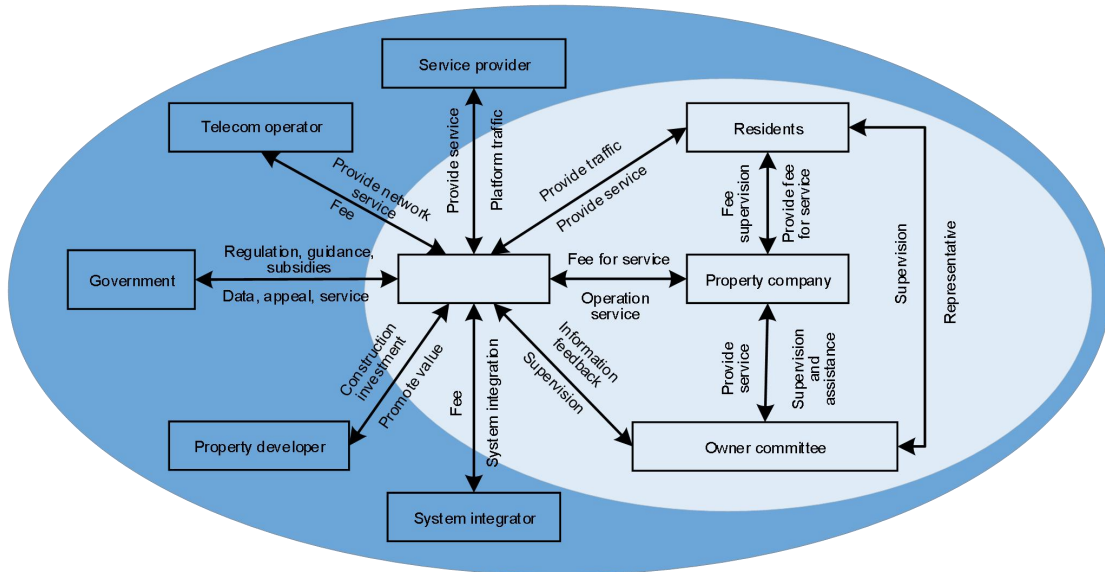


Fig. 1 Smart community operation interest community

As shown in Figure 1, the main elements of smart community operation include three dimensions: “demand-supply-regulation”: (1) demand side. As important participants in the operation of smart communities, residents provide stable user traffic for the operation of smart communities and participate in their construction and improvement; (2) supply side, including community property, real estate developers, etc., provides an intelligent service platform for residents by identifying their needs to ensure their safety and comfort. Some real estate developers gradually shift to the role of community service providers and provide high-quality management services through establishing property companies or cooperating with professional operators responsible for the operation of the communities; The system integrator is mainly responsible for the integration of security system and computer Internet Plus system, as well as the maintenance of equipment and system, providing technical support for the construction of intelligent platforms. Telecom operators provide Internet Plus support for the operation of smart communities, provide Internet Plus services to the community and charge fees; service providers provide property, business, medical and other service platforms for smart community operations; (3) Regulators. The government mainly acts as a guide in the community of interests, supervises and guides the operation of smart communities, and distributes subsidies scientifically and reasonably. In the process of community smart operation, the government mainly plays the following roles: firstly, the government establishes a good image for the publicity of smart communities and supervises the operation of smart communities in real time; secondly, it should improve the top-level design of the smart community construction system; thirdly, it should scientifically distribute government subsidies to smart communities to maintain the sustainability of their operations. It can be seen that the operation of smart communities mainly depends on the guidance of the government. With the joint participation of residents, real estate developers, property companies, service providers and other subjects, the overall Internet Plus of smart operation is gradually formed. By coordinating the interest relationship between different subjects and integrating resources, a community of interests is formed ultimately, and the resource sharing and information connectivity of smart communities are realized.

III. INTERNET PLUS MODEL CONSTRUCTION

Social Internet Plus analysis (SNA) is a quantitative analysis method used to study sociological relationships [11]. Based on the complex relationship between various interest subjects, the SNA model is used to construct a visual Internet Plus structure, which vividly and objectively describes the relationship between the various interest subjects that affect the operation of smart communities and the relationship between various influencing factors, thus accurately optimizing the operation system of smart communities and coordinating the interests of each subject.

A. Selection of samples

Firstly, the key points of participants’ information acquisition are clarified, and the social Internet Plus model of smart community construction is constructed by obtaining related data and attribute data. In this study, the

smart community survey adopts the snowball interview method. The interviewees are mainly typical representatives of the participants in the smart community operation, including employees of street offices, technology companies, and operators. Based on the interviews with relevant professionals, the difficulties in the operation of the smart community can be understood and scientifically analyzed. According to the influencing factors of other subjects reflected by the core participants, other interest subjects associated with them are pointed out, and they are interviewed with the same interview method. The process is repeated until no interest subjects are pointed out.

B. Extraction of influencing factors

Through field research, it is found that there are some problems in the operation process of each sample community, including insufficient level of technology application, insufficient division and coordination of government functions, fragmentation of the system, decision makers' incomplete consideration, and insufficient participation of ordinary actors. Based on the literature analysis of smart community operation and the multi-party demonstration of industry senior practitioners^[12-18], the risks of the influencing factors of smart community operation in China are divided into four categories: standard missing risk, behavior subject risk, information security risk, and technology application risk, as shown in Table 1.

Table 1 List of factors affecting smart community operations

Interest subjects	Serial No.	Influencing factors	Risk category	References
Government	A1	Insufficient consideration of community planning and community communication	Behavior subject risk	[12]
	A2	Fragmentation within the government leads to the fragmentation of technology applications and the resulting information islands and redundant construction.	Behavior subject risk	[12]
	A3	Failed coordination of top-level planning and design of technology applications and departments.	Technology application risk	[14]
	A4	Insufficient mastering of residents' demands.	Behavior subject risk	[16]
Residents	B1	Ordinary actors lack enthusiasm for the application of new technologies.	Behavior subject risk	[12]
	B2	Smart community services are less and the functions need to be improved.	Behavior subject risk	[18]
	B3	Lack of understanding and application ability of new technologies.	Technology application risk	[15]
	B4	Insufficient awareness of information security protection.	Information security risk	[12]
Property management company	C1	Lack of property management standard system	Standard missing risk	[16]
	C2	Lack of professional service personnel on the Internet of Things	Standard missing risk	[15]
	C3	Inappropriate management measures for data security	Information security risk	[12]
Telecom operator	D1	Basic communication Internet+ facilities are prone to failure.	Technology application risk	[13]
	D2	Information Internet+ technology does not fully cover.	Technology application risk	[15]
Property developer	E1	Fail to formulate the evaluation plan and definition index of smart community management.	Standard missing risk	[16]
	E2	Failure to timely rectify the existing problems item by item and supervise accountability	Standard missing risk	[17]
Owner committee	F1	Insufficient supervision of property companies	Standard missing risk	[15]
	F2	Insufficient understanding of smart community operations	Behavior subject risk	[18]
	F3	Unable to perform its duties well on behalf of the majority of residents.	Behavior subject risk	[16]
System integrator	G1	Untimely intelligent equipment maintenance	Technology application risk	[13]
	G2	Single service system access and service acquisition mode.	Technology application risk	[14]

	G3	Lack of feedback from ordinary actors on the application effect of the system.	Standard missing risk	[12]
	G4	Low degree of integration of service system	Technology application risk	[14]
Service provider	H1	Lack of service feedback	Standard missing risk	[13]
	H2	Separately develop service platforms	Technology application risk	[13]

C. Drawing of Internet Plus Structure Diagram

There are three basic relationships among the influencing factors: mutual independence, unilateral influence, and mutual influence [19]. Based on the questionnaire analysis, the 0-1 structure matrix represents the relationship between the influencing factors, and the relationship matrix is formed. Then the UCINET 6.0 software is employed to draw the Internet Plus structure diagram of the influencing factors, as shown in Figure 2. Different color nodes correspond to different interest subjects, for example, red represents the government, yellow represents the residents, light blue represents the property, dark blue represents the telecom operators, green represents the real estate developers, black represents the owners' committee, brown represents the system integrator, and pink represents the service provider.

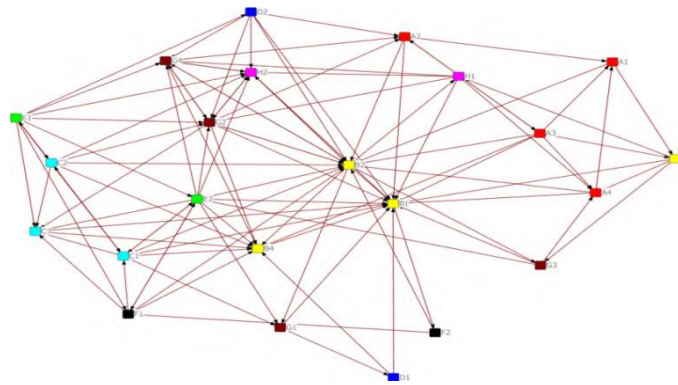


Fig.2 Internet Plus structure of influencing factors

As shown in Figure 2, there are relatively frequent links between various influencing factors, among which the government and residents are in the Internet Plus connection-intensive area. To further quantitatively analyze the degree of correlation between various influencing factors, it is necessary to carry out a targeted quantitative analysis of the software.

IV. INDEX ANALYSIS OF INTERNET PLUS

The relationship matrix of influencing factors is imported into UCINET 6.0 software, and the density of the Internet Plus graph is 0.207 5, which shows that there is not a particularly close relationship between the interest subjects of community operation. To explore how to effectively reduce the adverse impact of various interest subjects on the operation of smart communities and improve the efficiency of smart community operations and grassroots governance, Internet Plus correlation analysis, Internet Plus interest subject analysis and Internet Plus influence analysis are carried out, respectively:

A. Interest Subject Analysis of Internet Plus

By comparing the out-degree and in-degree of various interest subjects, their impact on the operation of smart communities can be mastered, thus putting forward targeted optimization suggestions. The statistical results of the out-degree and in-degree of each interest subject are shown in Table 3..

Table 3 Statistical results of out-degree and in-degree of various interest subjects

Interest subjects	Out-degree	In-degree
A Government	16	12
B Residents	14	41
C Property Company	15	11
D Telecom Operator	8	2
E Property Developer	19	5

F Owner Committee	7	4
G System Integrator	9	11
H Service Provider	9	10

It can be seen from Table 3 that the government and property developers have a high out-degree, indicating that their behaviors are more likely to affect other interest subjects in the operation of smart communities. Meanwhile, they play a leading role in the high-quality operation of smart communities, which fully reflects the importance of government-enterprise cooperation. The reason may be that the government and property developers participate in the planning and the entire smart community operation and have the advantage of controlling important information and resources. Residents have the highest in-degree, indicating that they are most vulnerable to the behavior of other interest subjects. Besides, they belong to the sensitive party in Internet Plus, showing that residents' participation and satisfaction are the key evaluation indicators of smart community operation.

B. Influence Analysis of Internet Plus

The correlation analysis of Internet Plus only reflects the number of factors affected by a certain factor and other factors but does not necessarily have a strong impact on many factors associated with other factors. To further analyze the influence of various factors, the Kaz index is introduced to obtain the key influencing factors of each interest subject. The results are shown in Table 4. Among them, Row S is the sum of the rows of the Kaz index matrix, indicating that the corresponding interest subject affects the index of others. Col S is the sum of the columns of the Kaz index matrix, indicating that the corresponding interest subject is affected by others.

Among the interest subjects, the factors with higher Row S are A3, B2, C1, D2, E2, F1, G2 and H1

Table 4 Analysis results of Katz index

Factors	Row S	Col S
A3	0.065	0.016
B2	0.073	0.114
C1	0.074	0.032
D2	0.057	0.016
E2	0.090	0.016
F1	0.049	0.032
G2	0.065	0.074
H1	0.049	0.025

After comprehensively analyzing the Kaz index and Figure 3, it can be concluded that except for F1 and H1, the other eight factors are located in the first and second quadrants, with high out-degree and strong influence, and occupy the dominant position in the Internet Plus conduction diagram

V. MANAGEMENT STRATEGIES OF SMART COMMUNITIES

As important representatives of regulation, demand and supply, the government, residents and property developers significantly influence other interest subjects or are easily influenced by others in the operation of smart communities. To promote the coordinated development of smart communities with the participation of multiple interest subjects, in this paper, the following suggestions are proposed from the three dimensions of "regulation-supply-demand":

(1) From the perspective of regulation, the top-level planning and design of technology applications should be improved, the operation of various departments should be coordinated, and the government's macro-control role should be given full play. Meanwhile, government guidance and public participation should be combined to unify the smart platform in different periods, avoid the repeated entry of data and the repeated construction of the platform, and realize the communion and sharing of community information.

(2) From the perspective of demand, it is urgent to provide technical services based on people's needs. Only by effectively improving and enhancing the intelligent service and quality provided by the smart community for residents and accurately grasping the urgent difficulties in residents' daily lives can the government truly achieve the goal of serving the people and reflect the core advantages and competitiveness of smart communities compared with general communities. There are few smart community services and their functions need to be improved. B2 is one of the most influential factors for residents and belongs to the core influencing factors. Therefore, community activities should be organized in a targeted manner to encourage residents to apply smart technologies, thus better realizing the improvement and promotion of technologies.

(3) From the perspective of suppliers, real estate developers should be encouraged to keep pace with the times, make full use of mobile communication technology, build a smart service platform with its own characteristics, and improve service quality. Combined with the statistical analysis of in-degree and out-degree, real estate developers are one of the two leading parties of community smart operation. Therefore, originally, the government established a smart community service platform alone, but now, they both cooperatively establish a platform. The intelligent business section of the platform design, such as security, fire protection, parking, maintenance, etc should be strengthened, and neighborhood mutual assistance, community activities, flea markets, etc should be set to strengthen the communication between the residents of the community and enrich the services of the smart community.

VI. CONCLUSION

Since the concept of smart community was put forward in 1992, the operation of smart community has become a hot topic for scholars at home and abroad. The main elements of smart community operation are identified from the dimensions of "demand-supply-regulation" to promote the coordinated development of smart communities with the participation of multiple interest subjects. Six typical smart community projects in Hangzhou are taken as the research objects, the social Internet Plus model is constructed based on literature research, the key subjects are identified, and multi-dimensional countermeasures and suggestions are put forward. The research reveals that the key subjects of smart community operation are government, residents and developers, and the corresponding key influencing factors are: Failed co-ordination of top-level planning and design of technology applications and departments (A3), smart community services are less and the functions need to be improved (B2), and failure to timely rectify the existing problems item by item and supervise accountability (E2). The urgent problem to be solved in the operation of smart communities is how to effectively stimulate residents' enthusiasm for participation. Through the leadership of the government and real estate developers and the cooperation with other interest subjects, a community of interests participated in by multiple interest subjects in the operation of smart communities is constructed.

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