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Influencing factors of resident satisfaction in smart community services：An empirical study in Chengdu

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ABSTRACT

Smart communities have shown great advantages in China's pandemic control, but also exposed the shortcomings that some smart community services (SCS) are out of touch with residents' needs in the post-pandemic era. Therefore, This study aims to explore those SCSs were needed to promote the sustainable development of smart communities. Based on the expectation disconfirmation theory and the modified ASCI model, this study establishes a smart community service resident satisfaction model and analyzes it with Amos structural equation model. The study results are as follows: (1) SCS outcome, ICT infrastructure, and SCS delivery all have a positive influence on resident satisfaction and their performances decrease in turn. (2) some of the factors that drive resident satisfaction most, such as Smart Property Service and Public Facility, have a lower rating. (3) residents are more concerned about the "cost" (including financial and emotional costs) than the quality of the SCSs. (4) Most residents' expectations of SCS are irrational and that's why it does not have a significant impact on satisfaction. (5) Resident Satisfaction is an important factor in enhancing Resident Confidence in SCS and promoting Resident Participation in improving SCS. This enlightens us that improving resident satisfaction is one of the effective ways to promote the sustainable development of Smart Community and continuously enhance the emergency response capabilities of grassroots communities in the post-pandemic era.

Keywords: Post-pandemic situation, Smart Community, Resident satisfaction, ASCI model, Expectation Disconfirmation Theory, SEM analysis.

INTRODUCTION

The outbreak of the Covid-19 pandemic has brought great impacts on human life, society, economy, politics and so on. In order to control the spread of the pandemic, countries around the world have adopted different prevention measures to control the flow and minimize large gathering of people. However, this is undoubtedly a difficult task for China, which has the second most population in the world. As the "frontline" of pandemic control, grassroots communities are bound to take territorial responsibility. They need to register the entering and leaving, monitor residents' body temperatures and do nucleic acid testing regularly, guarantee the supplies of necessary goods and medical services, etc., which place a great burden on the understaffed community work. In the meanwhile, smart community applies modern information technology to helps community workers reduce the stress, such as electronic access control, temperature measurement system, "health card" application, one-click reporting, WeChat community, "bracelet detection" for the elderly living alone, etc.

China set up the first batch of smart cities in 2013 and the first batch of smart communities in 2014. In order to guide the construction of smart communities, the Ministry of Housing and Urban-Rural Development organized the compilation and issue of the "*Guidelines for the Construction of Smart Communities (Trial)*" in 2014, which is the first top-level plan for the construction of smart communities in China. In May 2022, the Ministry of Civil Affairs and other nine departments issued the "*Opinions on Deeply Promoting the Construction of Smart Communities*", which further clarified the general requirements and development direction of smart community. With the normalization of pandemic situation, it is imperative to further improve and promote the construction of smart communities.

However, in the face of the pandemic, some problems were still exposed when communities supplies smart community services, such as ignorance of the collection of residents' actual needs, insufficient grasp of underlying needs at grassroots level, blindly pursuing back-end cloud deployment, etc. Intelligent applications are divorced from actual needs (Deng *et al.*, 2020). In the meantime, Li also pointed out that the insufficient management of intelligent tools and the lack of the platform data mining and residents' participation channels impair the potential of information technologies in communities (Li, 2020). In this regard, China's authoritative media also gave some sharp criticisms, such as "smart community is not smart, and still relies on indigenous methods in case of trouble", "the means and tools are flashy, and drop the ball at the key moments".

To this end, this paper aims at exploring what are the influential drivers of residents' satisfaction in Smart Community Services (SCS). We adopts the paradigm of mathematical empirical research. Based on the American Customer Satisfaction Index (ACSI) model, this study will select and define the main research variables and put forward research hypotheses. Then, a SCS Resident Satisfaction model will be preliminarily constructed. The data were collected through questionnaire surveys, and analyzed mainly through the Structural Equation Model (SEM) analysis. In the end, some policy implications were drawn correspondingly.

The structure of the remainder of this paper is as follows: the second section reviews the relevant articles and theories about smart community service and satisfaction. In the Section 3, we constructs a conceptual model of this study based on the ACSI and presents the hypothesis correspondingly. Section 4 describes the data sources, including sample selection and data collection. The process of empirical research is presented in the Section 5. Chapter 6 discusses the key findings of this paper and makes targeted policy recommendations. Chapter 7 summarizes the results of the study throughout the text.

LITERATURE REVIEW

Smart Community Service

The concept of smart community was first introduced in Silicon Valley, California, in 1993, where business leaders, community members, government officials, and educators sought to cope with the severe economic downturn and bring new life to the local community through the use of information technology. With deeper development of Smart Community, the understanding of smart community has roughly extends to not only the application of technology, but also a new governance form and value orientation.

Technology application emphasizes the use of Information and Communication Technologies (ICTs) in smart communities. For example, in Smart Communities Guidebook, which is developed by the California Institute for Smart Communities (1997) at San Diego State University (1997), the smart community is defined as:
a community in which government, business, and residents understand the potential of information technology, and make a conscious decision to use that technology to transform life and work in their region in significant and positive ways.

Governance form emphasizes that Smart Community reshapes the governance form of grassroots community. Jiang & Zhang believe that the smart community is a new type of community governance model, which is characterized by the fact that multiple subjects provide convenient, fast, transparent and fair public services to residents according to the actual needs of residents on the basis of integrating resources (Jiang & Zhang, 2017). Lindskog thinks that the Smart Community concept stresses the importance of collaboration, cooperation and partnership between all parties involved including public institutions, private sector, voluntary organizations, schools and citizens (Lindskog, H., 2004). Song believe that smart communities are promoting the generation of new forms of governance with the assistance of technology, which is reflected in the development of the main structure of governance from vertical to vertical and horizontal, the boundaries of governance role extend from afterwards to beforehand, and the mode of governance operation from division to co-governance (Song & Wang, 2020).

The value orientation emphasizes the ultimate value of the development of Smart Community. Shen put forward the concept of a humanistic-oriented smart community, which is the one with strong cohesion based on the collaboration and interconnection of the government, related industries and residents (Hanyan, H., 2021). Jiang believed that the value pursuit of Smart Community essentially requires us to rebuild a social community with a sense of belonging and identity (Lebrument, N., *et al.*, 2021).

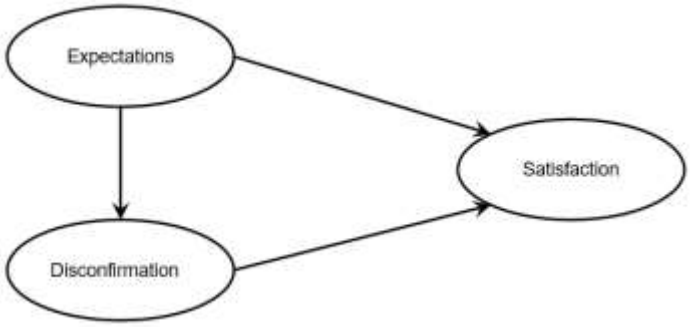
Based on the above opinions, smart community emphasizes more than technology. Residents play an important role in the development of smart community. So we think it is necessary to supply Smart Community Services with which residents are satisfied and encourage them to participate the development of their smart communities.

As for what Smart Community Services (SCSs) contain, different scholars and institutions have expressed different views. According to the *Implementation Guide* (1997) developed by California Institute for Smart Communities, Smart Community increases choice, convenience and control for people in the community as they live, work, travel, govern, shop, educate and entertain themselves. SCIN (Smart Community International Network) thinks the smart community means to make broadband-based services delivered – such as better health care delivery, better education and training, and new business opportunities. According to *China's Guidelines for the Construction of Smart Communities*, Smart Community should have perfect infrastructures, high community governance levels, as well as the diversified community public services, and intelligent convenience services. According to Xu Li, a smart community consists of three domains: the home domain, community domain, and service domain (Li *et al.*, 2011). It can be seen that SCSs involve a wide range of issues. From the perspective of functions, it includes education, employment, pension, medical care, distribution, home, business, etc. From the perspective of providers, it covers governments, enterprises, communities and non-profit organizations. Thus, it seems necessary to know which services are the influential drivers of resident satisfaction in order to keep sustainable development of smart communities.

Expectation disconfirmation theory and models

Further, in order to clarify the influencing factors of resident satisfaction of SCSs, this paper reviews some customer satisfaction models widely used.

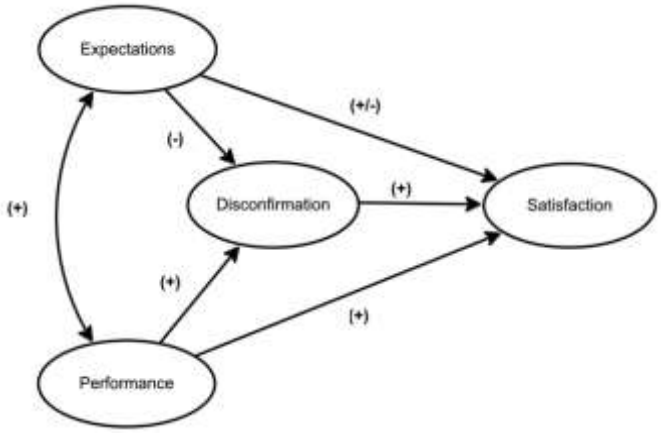
In 1965, Cardozo first introduced the concept of consumer satisfaction into marketing, and found that customer expectations are an important precursor to their satisfaction, that is, when the product don't meet expectations, consumer satisfaction is lower (Cardozo, R. N., 1965). In 1977 Oliver R. L. measured the effects of disconfirmation independent of the level of expectations, and concluded that consumer satisfaction depended on expectations and their degree of disconfirmation with actual experience. Then, he proposed the Expectation Disconfirmation Theory in his book *Satisfaction: A Consumer's Behavioral Perspective*. The theory argues that satisfaction is achieved through a two-stage process. In the first stage, customers will form "expectations" about the performance of the product before purchasing. After the customer purchases, they compare the true performance level of the consumer product with the expectations before the purchase, thus forming a gap between the two, which is called "disconfirmation". In the second stage, customers make different "satisfaction" responses in different situations of "disconfirmation": when the actual performance is the same as the expectation, that is, the "disconfirmation" is zero, the customer produces "moderate satisfaction"; When actual performance exceeds expectations, that is, "disconfirmation" are positive, resulting in "satisfaction"; When the actual performance does not meet expectations, that is, "disconfirmation" are negative, resulting in "dissatisfaction" (Oliver, R. L., 1980). Therefore, the initial expectation disconfirmation model (as shown in Figure 1) includes three basic variables: expectation, disconfirmation, and satisfaction.



Source: This study.

Figure 1: Initial “Expectation-Disconfirmation” model.

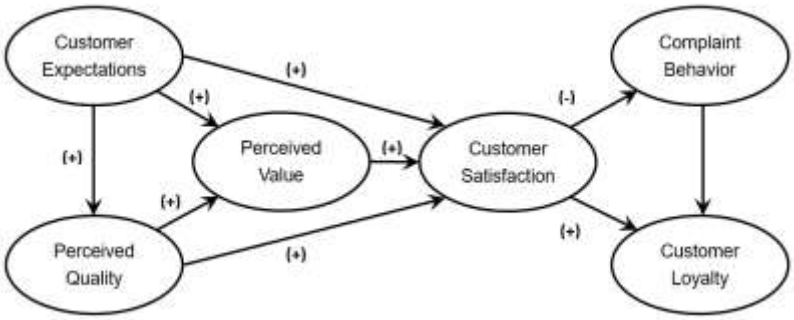
However, scholars such as Oliver R. L. ignored that the perceived product experience of the consumer also directly affects the satisfaction of consumers. Experiments by Churchill G. A. in 1982 proved, in addition to influencing consumer perceived disconfirmation, perceived performance itself has a direct impact on satisfaction, that is, when the performance of a product or service is good, customers will be satisfied, regardless of whether expectations are confirmed or not (Churchill G. A. & Surprenant, C., 1982). So he added Performance to the initial "Expectation-Disconfirmation" model to form an extended "Expectation-Disconfirmation" model (as shown in Figure 2).



Source: This study.

Figure 2: Extended "Expectation-Disconfirmation" model.

However, satisfaction is a “decision” after one choice at a time, with discontinuity. This is not enough for the organization who wants to evolve from intermittent satisfaction to continuous satisfaction, that is, Customer Loyalty. Based on this idea, in 1994, Claes Fornell, a professor at the University of Michigan and the Center for Quality Studies in the United States, who made outstanding contributions to customer satisfaction evaluation, proposed the American Customer Satisfaction Index Model (ACSI, Figure 3).



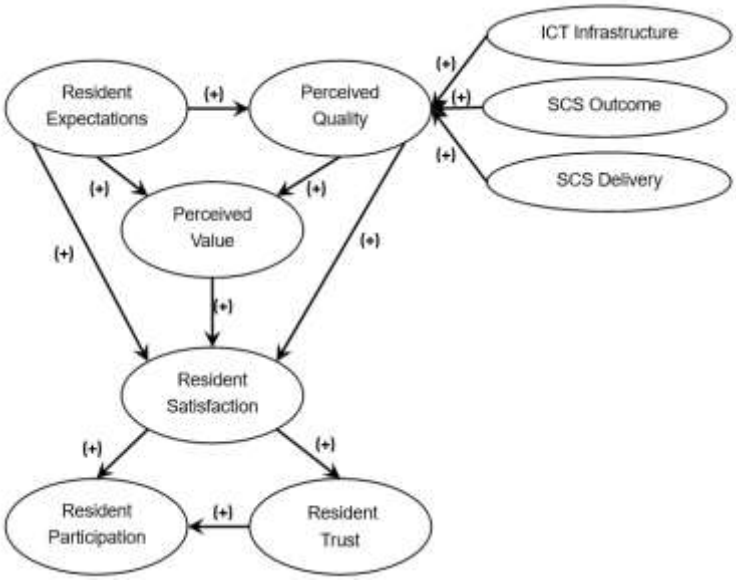
Source: This study.
Figure 3: American Customer Satisfaction Index model.

The first researcher to introduce the concept of customer satisfaction into the community service research was the Gregg G. Van Ryzin. His School of Public Administration at city university in New York and the City Council of New York collaborated to survey the satisfaction of New York city residents with public affairs between 2000 and 2001, and the ACSI model was used in his research (Van Ryzin, G. G. *et al.*, 2004).

Throughout academia, in spite of the widely application of ACSI model, there are still insufficient research in the community service, especially Smart Community Service. Especially in Chinese institutional context, Smart Community Service has its peculiarities: Residents are not only the consumers of community services, but also providers. Community is a kind of self-governance organization, so the participation of residents in the improvement and supply of community services is an important factor. As the primary beneficiaries, residents should play a greater role in providing opinions and even in decision-making (Goodman N. *et al.*, 2020). Thus, how does Resident Satisfaction affect Resident Participation is also a question this study concerns.

CONCEPTUAL MODEL AND HYPOTHESIS

The conceptual model constructed in this article is shown in the figure 4, which includes nine potential variables. Four exogenous variables, namely Resident Expectations, ICT Infrastructure, SCS Outcome, SCS Delivery; The five endogenous variables were Perceived Quality, Perceived Value, Resident Satisfaction, Resident Trust, and Resident Participation.



Source: This study.
Figure 4: Conceptual model.

According to ACSI model, we propose:

Resident Expectation has a positive impact on Perceived Quality
Resident Expectation has a negative impact on Perceived Value
Perceived Quality has a positive impact on Perceived Value
Resident Expectation has a positive impact on Resident Satisfaction
Perceived Quality has a positive impact on Resident Satisfaction
Perceived Value has a positive impact on Resident Satisfaction

In addition, as for the factors affecting Perceived Quality, it is undoubtful that community services include both tangible products and intangible services, so residents' perception of service quality is also affected by more diversified factors. According to the model first proposed by Christian Gronroos to measure the quality of service, he divided the quality of service into technical quality (the result of the service) and functional quality (the process of service). Based on this, this paper proposes to refine the impact factor of Perceived Quality into three dimensions: Infrastructure, Outcome and Delivery.

ICT Infrastructure has a positive impact on Perceived Quality
SCS Outcome has a positive impact on Perceived Quality
SCS Delivery has a positive impact on Perceived Quality

Trust is the outcomes of satisfaction. The relevant theoretical school in the field of marketing holds that satisfied customers will choose to buy or continue to buy products or services, and are willing to pay a premium for the product, build trust with enterprises, and form long-term and sustainable reciprocal relationships (Castaldo, S., 2009). This law may also apply to community service. Trust is a state of mind based on sustained satisfaction, and its level of abstraction is higher than satisfaction, so long-term and high satisfaction with public services is conducive to the formation of a high degree of trust (Christensen, T. *et al.*, 2005). Based on this, we propose:

Resident Satisfaction has a positive impact on Resident Trust

The influencing factors of resident participation are resident satisfaction and resident trust. When consumers have a higher level of satisfaction and trust in the brand virtual community, it is easier to favor the brand, which in turn leads to active post-purchase behaviors such as participating in the brand's product improvement activities. This paper argues that when residents have a more positive attitude (satisfaction or trust) towards smart community services, the more likely they are to develop a sense of ownership and participate in the improvement of smart community services. Based on this, we propose:

Resident Satisfaction has a positive impact on Resident Participation
Resident Trust has a positive impact on Resident Participation

Table1: the study hypothesis.

	Hypothetical content
H1	Resident Expectation has a positive impact on Perceived Quality
H2	ICT Infrastructure has a positive impact on Perceived Quality
H3	SCS Outcome has a positive impact on Perceived Quality
H4	SCS Delivery has a positive impact on Perceived Quality
H5	Resident Expectation has a positive impact on Perceived Value
H6	Perceived Quality has a positive impact on Perceived Value
H7	Resident Expectation has a positive impact on Resident Satisfaction
H8	Perceived Quality has a positive impact on Resident Satisfaction
H9	Perceived Value has a positive impact on Resident Satisfaction
H10	Resident Satisfaction has a positive impact on Resident Trust
H11	Resident Satisfaction has a positive impact on Resident Participation
H12	Resident trust has a positive impact on Resident Participation

Source: This study.

DATA COLLECTION

The Samples

Data collection was carried out within the city of Chengdu. Chengdu is the epitome of China's smart community construction process, its smart community construction began in 2013. In June 2020, Chengdu Municipal People's Government published the *"Tianfu Smart Community Construction Guidelines Version 1.0"*, and in the same year selected 30 smart community construction pilot units to create 400 smart application scenarios. This provides a basis for the selection of research samples. Based on the understanding of the construction of smart communities in Chengdu, the project team selected the Hengdacheng Community in Wenjiang District, Xingrong Community in High-tech Zone, and Zhiqiang Community in Chenghua District for questionnaire distribution after conducting full field research.

Pre-investigation

Based on the Smart Community Service resident satisfaction model, this study designed a questionnaire which mainly includes two parts: the first part is the basic personal information; the second part is the measurement of the core variables involved in the study, including ICT Infrastructure, SCS Outcome, SCS Delivery, Resident Expectation, Perceived Quality, Perceived Value, Resident Satisfaction, Resident Trust and Resident Participation. These variables were measured by the Likert five-level scale.

Further, to test the quality of the questionnaire, a pre-survey was conducted, through which we can find out the problems that may occur in the implementation of the questionnaire in advance, adjust and modify the questionnaire to avoid errors in the formal survey. 20 samples were selected from each of the three investigated communities. The questionnaires were distributed face to face and 60 valid questionnaires were collected.

Based on the data collected in the pre-survey, SPSS 26 was used to test the reliability and validity of the formal questionnaire. Cronbachα for each variable is more than 0.9, indicating that the internal reliability of the scale is excellent. The KMO values are all more than 0.7, and the significance of the Batley spherical degree test is less than 0.05, which passes the validity test. CITC≧ 0.5 indicates that the question setting is reasonable and all question items are retained.

Table2: Reliability and validity test results.

		CITC	Cronbach after deleting item α	Cronbach's α	KMO	AVE	CR
Resident Expectation	RE1	.833	.942	.938	.726***	0.781	0.709
	RE 2	.921	.871				
	RE 3	.865	.916				
Perceived Quality	PQ1	.914	.939	.959	.780***	0.821	0.757
	PQ 2	.907	.944				
	PQ 3	.919	.935				
ICT Infrastructure	ICT1	.873	.899	.931	.767***	0.780	0.773
	ICT 2	.873	.893				
	ICT 3	.850	.909				
SCS Outcome	OUT1	.815	.925	.935	.816***	0.542	0.571
	OUT 2	.879	.904				
	OUT 3	.856	.912				
	OUT 4	.833	.919				
SCS Delivery	DEL1	.911	.949	.961	.804***	0.777	0.767
	DEL 2	.902	.950				
	DEL 3	.900	.954				
	DEL 4	.924	.944				
Perceived Value	PV1	.900	.909	.945	.771***	0.759	0.747
	PV 2	.874	.929				
	PV 3	.885	.922				
Resident Satisfaction	RS1	.894	.918	.947	.760***	0.610	0.681
	RS 2	.859	.945				
	RS 3	.913	.903				
Resident Trust	RT1	.926	.898	.946	.733***	0.767	0.715
	RT2	.926	.898				
	RT3	.838	.977				
Resident Participation	RP1	. 856	.885	.953	.759***	0.740	0.659
	RP2	. 945	.897				
	RP3	. 921	.901				

Source: This study.

This study compares the correlation coefficient between variables with the quadratic root of AVE value. The quadratic root of the AVE value of each variable is more significant than 0.736 and greater than the correlation coefficient between variables, so it has good aggregate validity and discriminant validity.

Table 3: Aggregate validity and discriminant validity.

	ICT	OUT	DEL	RE	PQ	PV	RS	RT	RP
ICT	0.883								
OUT	0.637	0.736							
DEL	0.362	0.594	0.881						
RE	0.305	0.604	0.301	0.883					
PQ	0.409	0.563	0.409	0.247	0.906				

PV	0.209	0.316	0.208	0.253	0.434	0.871			
RS	0.246	0.376	0.246	0.311	0.504	0.785	0.781		
RT	0.144	0.219	0.143	0.182	0.294	0.574	0.583	0.875	
RP	0.142	0.216	0.141	0.179	0.289	0.566	0.574	0.658	0.860

Source: This study.

Formal Investigation

The formal investigation was conducted from 5 March 2021 to 11 April 2021. The final questionnaire was distributed offline mainly with the help of community workers in spite that their presence may has an influence on the survey results. Finally, 342 valid questionnaires were collected, and the effective recovery rate was 91.9%.

Table 4: Issuance and recovery of formal questionnaires.

Community	Number of questionnaires distributed	Number of recycled questionnaires	The number of valid questionnaires	Effective recovery rate
HengDaCheng Community	129	129	119	92.2%
XingRong Community	116	116	102	87.9%
ZhiQiang Community	127	127	121	95.2%
total	372	372	342	91.9%

Source: This study.

RESULT

Descriptive Statistics

The following table lists some variables for basic characteristics of the samples. Among them, men accounted for 38% while women accounted for 62%. The proportion was not balanced, which is related to the fact that women are more socially involved and more willing to cooperate with our questionnaire. And we can also see that more than 90% of the respondents had lived 2 years or above, which ensures their contact with the community. The distribution of other variables is also in line with objective reality and the sample is representative to a certain extent.

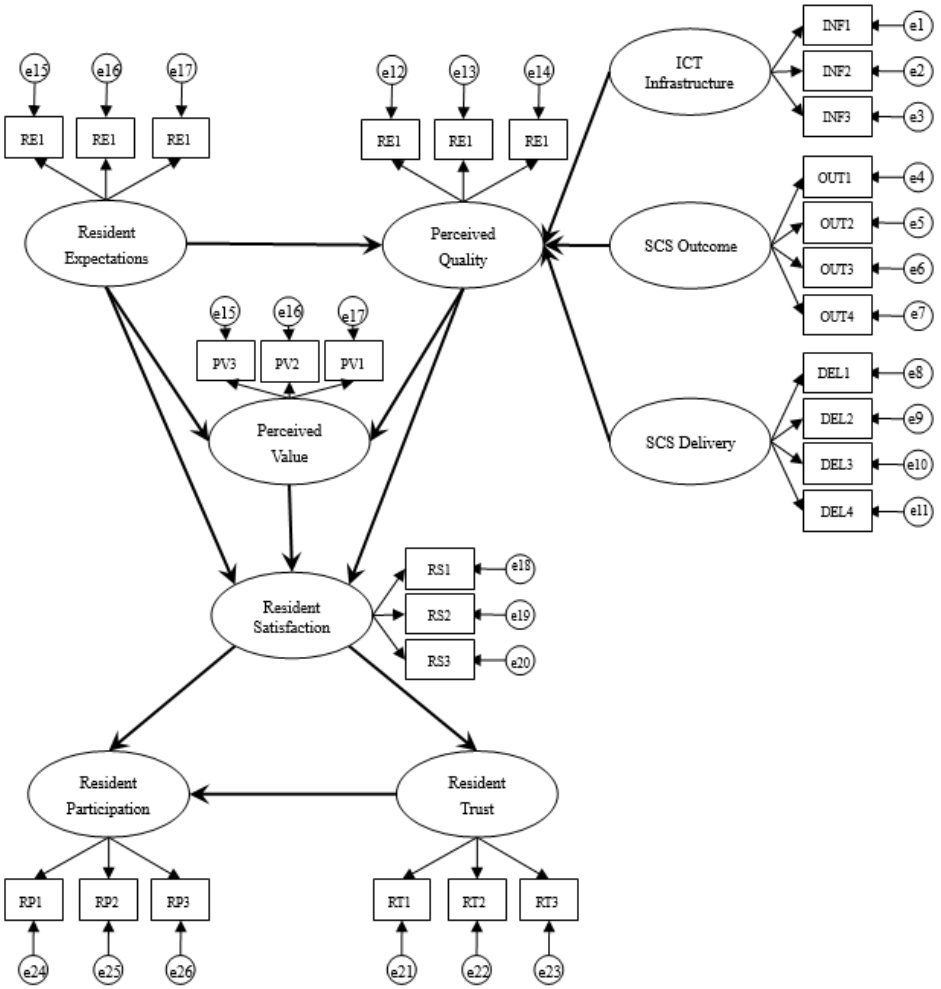
Table 5: the characteristics of the samples.

Variables		Frequency	Percentage（%）
Gender	man	130	38.0
	woman	212	62.0
Age	≤20	26	7.6
	20~40	190	55.6
	40~60	95	27.8
	＞60	31	9.1
Job	Public officials	71	20.7
	Corporate employees	88	25.7
	Self-employed	51	14.9
	Farmers	13	3.8
	Students	32	9.4
	Departing or retiring	59	17.3
	other	28	8.2
Education	High school and below	102	29.8
	College	96	28.1
	Bachelor	129	37.7
	Master and above	15	4.4
Living Duration	Less than 1year	31	9.1
	2-5 years	111	32.5
	6-10 years	93	27.2
	11years and above	107	31.3

Source: This study.

Structural Equation Analysis

To further clarify the influence of different variables, this paper used SEM for analysis. First, the following model is drawn in AMOS24 (Figure 2), which contains 9 latent variables (including 4 exogenous variables and 5 endogenous variables) and 26 observational variables.



Source: This study.

Figure5: structural equation model of resident satisfaction in smart community services.

Model fitting

First, we need to evaluate whether the above initial model holds. Structural equation model evaluation is divided into three parts: measurement model evaluation, structural model evaluation, and model fit evaluation, which are judged by factor loading, path coefficient, and fitting index, respectively. This study applied four fitting index: RMSEA, GFI, NNFI, and CFI, which are not affected by the sample size, punish complex models and sensitive to misdesigned models (Marsh, H. W. & Balla, J., 1994). The evaluation results of the initial structural equation model are shown in Tables 6, 7, and 8.

It can be seen from Table 6 that only three of the fitted values of the initial model have reached the criteria. From Table 7, the factor loading coefficients of each variable are greater than 0.5, indicating that each observation variable is of statistical significance and can well reflect the corresponding potential variables. From Table 8, it can be seen that three paths do not pass the statistical test at a confidence level of 90%, indicating that there is still room for optimization of the model.

Table 6: Fitting test results.

Index Name		Fitting value of this model	Critical value	Recommend value
Absolute fitting index (Overall Fitting Index)	GFI	0.832	＞0.9	> 0.8
	RMSEA	0.084	＜0.05	＜0.08
Relative fitting index (Delta Fitting Index)	CFI	0.892	> 0.9	> 0.8
	NNFI	0.878	> 0.9	> 0.8

Source: This study.

Table 7: Model factor loading results.

		Estimate
Resident Expectation	RE1	.869
	RE 2	.916
	RE 3	.866
Perceived Quality	PQ1	.915
	PQ 2	.900
	PQ 3	.903
ICT Infrastructure	ICT1	.878
	ICT 2	.896
	ICT 3	.875
SCS Outcome	OUT1	.740
	OUT 2	.763
	OUT 3	.725
	OUT 4	.715
SCS Delivery	DEL1	.839
	DEL 2	.920
	DEL 3	.884
	DEL 4	.880
Perceived Value	PV1	.886
	PV 2	.886
	PV 3	.841
Resident Satisfaction	RS1	.694
	RS 2	.750
	RS 3	.887
Resident Trust	RT1	.864
	RT2	.883
	RT3	.881
Resident Participation	RP1	.853
	RP2	.869
	RP3	.859

Source: This study.

Table 8: Standardized path coefficient estimation results.

	Estimate	P
Perceived Quality←Resident Expectation	-.191	.190
Perceived Quality←ICT Infrastructure	.098	.001
Perceived Quality←SCS Outcome	.911	***
Perceived Quality←SCS Delivery	.031	.005
Perceive Value←Resident Expectation	.192	.251
Perceive Value←Perceived Quality	.391	***
Resident Satisfaction←Resident Expectation	.087	.670
Resident Satisfaction←Perceived Quality	.097	***
Resident Satisfaction←Perceive Value	.589	***
Resident Trust←Resident Satisfaction	.799	***
Resident Participation←Resident Trust	.432	***
Resident Participation←Resident Satisfaction	.398	***

Source: This study.

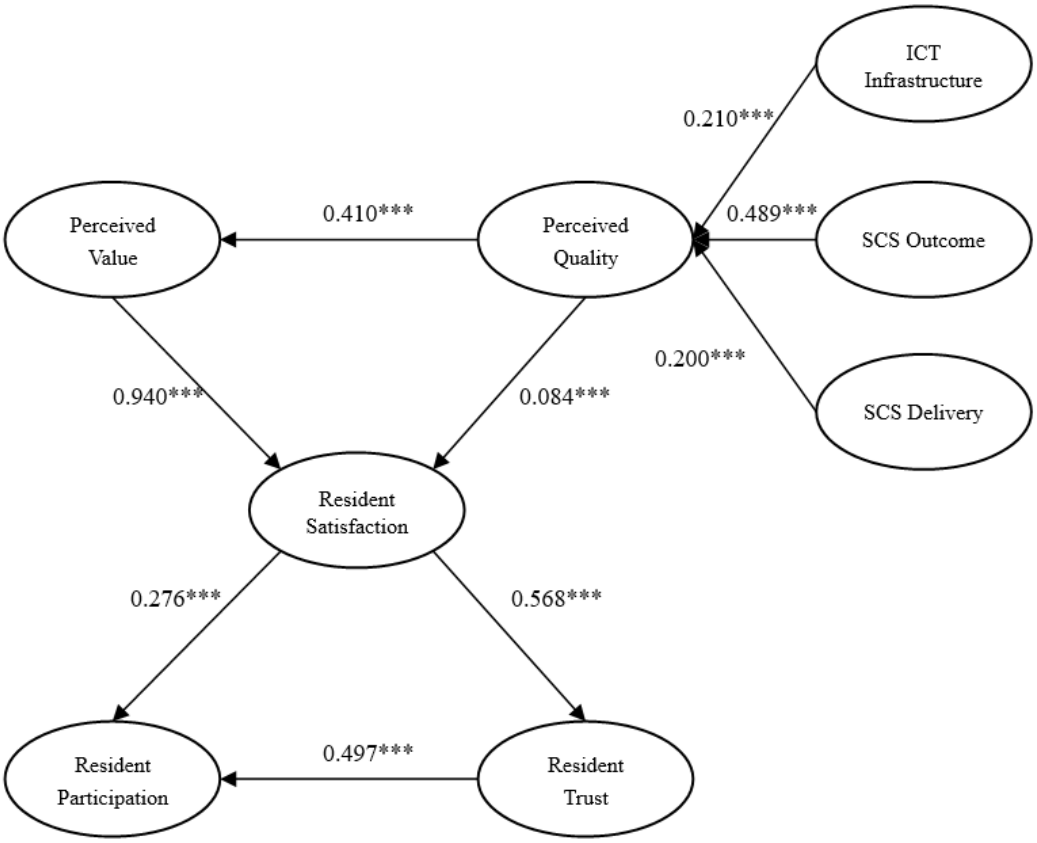
Model modification

The correction of structural equation models generally adopts two methods, model extension and model limitation. Model restriction refers to deleting insignificant paths in the initial model, or restricting some paths to make the model more clear. There is a path in this study that is not significant, so the "resident expectations - perceived quality", "resident expectations - perceived value", "resident expectations – resident satisfaction" paths are deleted in the model correction. After the correction, the fitting index of the model tends to be better, and the standardized path coefficient of the model is significant, so the modified model is accepted as the final model (as shown in the figure 6).

Table 9: Corrected fitting test results.

Index Name		Fitting value of this model	Critical value	Recommend value
Absolute fitting index (Overall Fitting Index)	GFI	0.847	＞0.9	> 0.8
	RMSEA	0.071	＜0.05	＜0.08
Relative fitting index (Delta Fitting Index)	CFI	0.913	> 0.9	> 0.8
	NNFI	0.923	> 0.9	> 0.8

Source: This study.



Source: This study.

Figure 6: simulation path coefficient diagram.

According to the analysis results of the structural equation model, the influencing factors and influencing mechanisms of resident satisfaction with SCSs are studied. According to the results of the SEM analysis, H1, H5, H7 did not pass the test, and the results obtained are shown in the table:

Table 10: Hypothesis test results

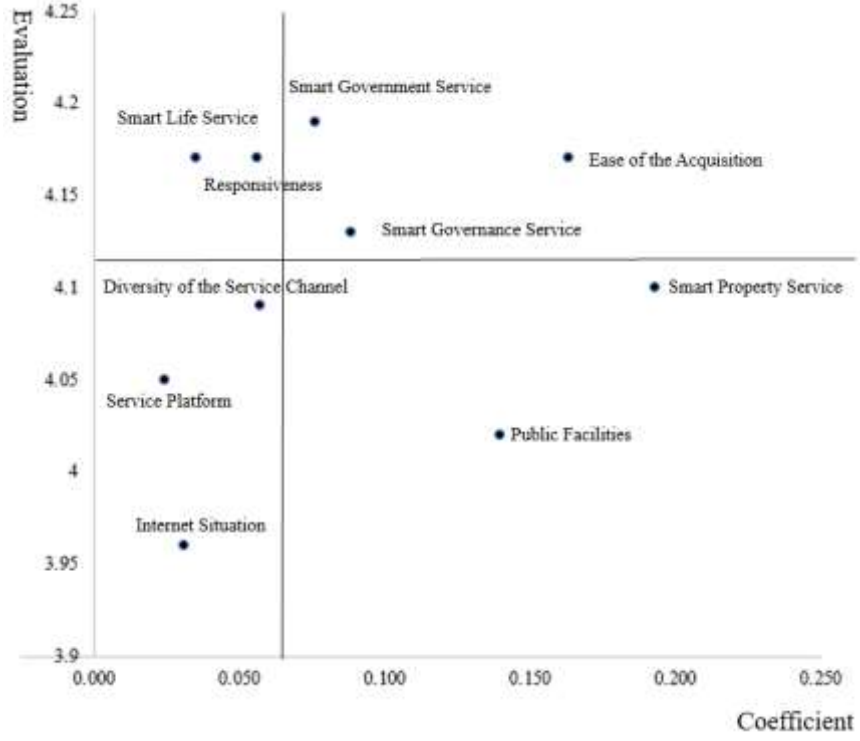
	Hypothetical content	Result
H1	Resident Expectation has a positive impact on Perceived Quality	Refused
H2	ICT Infrastructure has a positive impact on Perceived Quality	Accepted
H3	SCS Outcome has a positive impact on Perceived Quality	Accepted
H4	SCS Delivery has a positive impact on Perceived Quality	Accepted
H5	Resident Expectation has a positive impact on Perceived Value	Refused

H6	Perceived Quality has a positive impact on Perceived Value	Accepted
H7	Resident Expectation has a positive impact on Resident Satisfaction	Refused
H8	Perceived Quality has a positive impact on Resident Satisfaction	Accepted
H9	Perceived Value has a positive impact on Resident Satisfaction	Accepted
H10	Resident Satisfaction has a positive impact on Resident Trust	Accepted
H11	Resident Satisfaction has a positive impact on Resident Participation	Accepted
H12	Resident trust has a positive impact on Resident Participation	Accepted

Source: This study.

Linear regression analysis

In order to further understand the performance of specific SCSs on Resident Satisfaction, a simple linear regression analysis was conducted. The independent variables include 11 indicators, which are the observed variables of ICT Infrastructure, SCS Outcome and SCS Delivery, and the dependent variable is the overall satisfaction of residents, which is the observed variables of Resident Satisfaction. Except for the variable "clarity of the service platform function", the remaining variables have a significant impact on the overall satisfaction of the residents at a confidence level of 90%. Further, we take the resident evaluation of these SCSs as the ordinate coordinate, and the coefficient as the abscissa coordinate to draw the figure below. The horizontal and vertical lines in the figure respectively represent the average level of resident evaluation and the average level of coefficient. The overall level of resident evaluation is seemingly very high, which may be related to the community workers' presence in the survey and the residents' tendency to have a good social evaluation. As we can see in the figure 7, the Network Situation is rated lowest, while Smart Government Service highest. Smart Property Service has the greatest impact on the overall satisfaction, and the Service Platform has the smallest impact. It is worth noting that Smart Property Service and Public Facilities have a greater impact on overall satisfaction, but they have not shown high evaluations. To a certain extent, the results show some shortcomings of SCSs.



Source: This study.

Figure 7: Specific SCSs performance

DISCCUTION

Empirical results discussion

The explanation of the empirical findings in this paper will be supplemented by interviews. Interviews and questionnaires were conducted at the same time, thus ensuring consistency of sample sources. Interviews are conducted in a semi-structured manner. Subject to anonymity and consent of the interviewee, the interview is recorded and transcribed to text. In the end, 52 interview records were obtained, and the duration of the interviews ranged from 21 mins to 42 mins. With the help of NVivo software,203 valid interview statements were transcribed, encoded and analyzed using the thematic analysis technique.

Resident Expectation has no significant impact on Resident Satisfaction

Resident Expectation has a bad performance in the study model. Some similar results have also been seen at Johnson and Martensen's paper (Johnson, M. D. *et al.*, 2001; Martensen, A. *et al.*, 2000). This study argues that this conclusion reflects the lack of sufficient experience and awareness of residents to use SCSs to form rational expectations. This can be caused by the following three reasons:

First, SCSs are not mature, still in the pilot exploration stage. It takes a certain amount of time to make residents gradually contact with SCSs and have a basic understanding of them. And due to the difficulty to build a basic technical framework in these communities, especially those old communities, the existing SCSs that are in direct contact with residents are relatively scattered. Therefore, residents' perception of SCSs is not obvious, and it is impossible to form accurate and rational expectations for them. During our research, staff from different communities gave us feedback:

This work (the construction of Smart Community) was promoted in 2019, and then in 2020, various communities also began gradually. Thus, the SCSs' coverage of the population is not very extensive.

What we've done is slowly implanting these services, and it will definitely take time for residents to understand.

At present, our community supplies mainly smart security service, and other application scenarios are considered to add in constantly. Some negotiations need to be conducted step by step.

Second, the supply and demand of SCSs are misaligned. Most of the construction of smart communities in China is promoted by grassroots government, rather than residents themselves. Therefore, there may be a lack of awareness of the residents' needs in the construction process. At the same time, the heterogeneity of urban community residents means that they have more personalized demand for SCSs. For example, the elderly may have certain difficulties in technology acceptance so that a "age-appropriate" transformation of SCSs may be needed. This phenomenon can be reflected by feedback as follows:

The financial funds or the investment must be first used in the most basic and important part (eg. network). For the related services of the smart community you mentioned, the residents' possible feelings are not so strong and obvious.

There may be only more than a dozen households who has used the VR Planning Pavilion project. So for a resident who hasn't experienced the program, he probably doesn't have a perception of the effect that technology or smart community brings to residents.

How do residents know what your smart community is, for ordinary residents, especially for the elderly, he does not understand much and maybe does not believe it, right? So I think the problem of the operation needs to be considered.

Third, the "attractiveness" of SCSs is insufficient. The obvious change brought about by the market-oriented reform is the transfer of community functions to the entire city area. Many residents are not "customer sticky" to community service, and they are more inclined to seek the services they need across the city. Due to the limitations of subjective and objective conditions such as funds and resources, community services are less competitive than market services, so the residents do not have too many expectations for community services. As a resident said: *Many young people are actually not very willing to participate in the community as the elderly.*

But at the same time, we also see the potential of SCSs to "bring residents back to the community". Residents, especially young people, may be willing to use SCSs out of curiosity.

Because young people are used to contacting with others online rather than offline, some community activity information will be released through WeChat groups in order to promote their participation.

Perceived Quality is mainly affected by SCS Outcomes, and the impact of ICT Infrastructure and SCS Delivery is smaller

Of the three factors that significantly affect the Perceived Quality, SCS Outcomes interpreted it to a degree of 48.9%, while ICT Infrastructure and SCS Delivery only 20%. This reveals that the three factors are all the drivers of Resident Satisfaction. Specificly, there are some SCSs which have greater impact on the overall satisfaction but lower evaluation of the residents. This result reveals the shortcoming that some SCSs have not met the resident's needs, which we should pay more attention to them.

Perceived value rather than perceived quality affects Resident Satisfaction

In addition, "Perceived Quality" interpreted Resident Satisfaction to a degree of 47%(including direct effects and mediating effects), while "Perceived Value"94%. Comparing the explanatory power of perceived quality and perceived value, it can be found that Resident Satisfaction is not only affected by the quality of the SCSs, but also by residents' perception of SCSs costs. In other words, SCSs with high "cost performance" are more likely to be recognized by residents. Resident Satisfaction will be significantly enhanced if they can obtain quality services with less cost, less effort, and less risk. This enlightens us to consider the "profits" and "losses" of residents in the supply of SCSs, and try to avoid flashy SCSs.

Resident Satisfaction has a significant impact on both Resident Trust and Resident Participation

From the analysis results of the structural equation model, it can be seen that Resident Satisfaction can explain Resident Participation at the level of 56%, and the explanatory level of Resident Trust is 50%, which are consistent with the hypothesis of this paper. The enlightenment of this conclusion is that, by improving resident satisfaction and thus building a kind of trust relationship, a wider range of residents will be attracted to use and participate in the promotion of SCSs, which is conducive to the penetration of SCSs. In the long run, the establishment of the "satisfaction-trust-participation" mechanism is beneficial to achieve benign circle of SCSs development.

Countermeasure and suggestions

Strengthen the publicity of Smart Community Service

The impact of Resident Expectation on Perceived Quality is not obvious, which means that residents lack sufficient knowledge and experience of the actual performance of SCSs, so it is difficult to reasonably predict. Therefore, it is particularly important to stimulate the demand for public services through publicity and guidance (Zhang & Li, 2017). First of all, design a characteristic smart application scenario to draw a beautiful picture of the smart community for the residents and improve the residents' awareness of the smart service. Second, for residents with different demographic characteristics and different needs, guide them to pay attention to and use relevant smart projects to stimulate residents' demand for SCSs. Finally, through various training and education methods, the digital skills and operational proficiency of residents will be improved, and the feasibility of residents using SCSs will be improved. Through the above three points, we will promote the use and penetration of SCSs among all residents, and lay a certain "user foundation" for the development of smart communities.

Provide those SCSs that meet the needs of residents

The driving force and source of the development of smart communities should come from the needs of residents. If it is divorced from the needs of residents, the construction of smart communities may lose its direction, and it is difficult to obtain accurate feedback from residents, which is not conducive to the sustainable supply and further improvement of SCSs. Therefore, the smart community service supply abandons the "top-down" design idea and returns to the "bottom-up" life standard (Wang, 2020). Although the policies, funds and other resources required for the construction of smart communities are inseparable from the support of the government and market enterprises, this does not mean that the construction of smart communities should be planned and constructed according to their wishes. On the contrary, the frontline workers and residents of the community are the people who truly understand the life situation of the community, and they are the main participants and decision-makers in the construction of smart communities, not just the role of policy implementers. The design of smart service projects should fully consider the different types of communities and the differences in the composition of community residents, based on the characteristics of the community itself, coordinate the allocation of relevant resources, and design applicable and practical smart service scenarios. When planning smart community service projects, community workers should base themselves on long-term development goals, pay attention to the evolution catalysis of the community itself, internal functions and external functions, create sustainable development of smart service projects, and respond to heterogeneous and changeable residents' needs.

Integrate online and offline SCSs

The result that the service process has a small impact on the perceived quality enlightens us that the construction of smart communities not only needs to improve the online service platform, but also pays attention to the emotional experience of residents in the process of manual service. The construction of smart communities is not only a technical issue, but also a matter of system and mechanism. Only by fully coordinating technical elements and institutional elements can we form a high-quality smart community service system. This article believes that we can start from the following two aspects:

First, mobilize offline resources to support online platforms. Our survey found that the functions of the community's smart service platform are mainly based on community information publicity, community activity release, etc., and the coverage is narrow, and many residents have practical needs of the services that are not integrated into the platform. The integration of these services must first open up the system and mechanism of cooperation, and then supplemented by corresponding technical means, in order to promote information sharing and business collaboration between the community and other entities, and help the realization of the goal of "one-stop service".

Second, online services have "landed" to benefit residents. Another key point in the integration of online and offline services is to effectively solve the needs of online residents offline. In our survey, we found that many online service platforms such as public accounts, mini programs, and APPS in many smart communities have different degrees of "zombie websites", and these platforms have become "decorations" and "facades". The solution to this problem comes down to improving the institutional system that is compatible with the operation of the platform. Subjectively raise the service awareness of community workers, grassroots governments and other relevant parties through specific incentives; Objectively, the necessary supervision and retrospective procedures can be set up to assess the effectiveness of the service.

Based on residents' satisfaction and residents' trust, guide residents to participate in the improvement of SCSs

The word "smart" in the smart community highlights the importance of human participation more (Dutta-Bergman, M. J., 2005). Objectively speaking, the construction of smart communities in China is still in the initial exploration stage, and it is indispensable to mobilize residents to participate in the improvement of the smart service system. Therefore, on the basis of

stimulating residents' demand for SCSs, let residents see the broad prospects of smart services, in order to improve residents' motivation to participate. From the perspective of the "satisfaction-participation" path, it is necessary to give residents a convenient feedback and supervision channel to empower residents to continue to participate in the improvement of SCSs. From the perspective of the path of "satisfaction-trust-participation", residents have a strong relationship with the community, so it is necessary to play the "emotional card" well, stimulate the residents' sense of ownership and then make them actively participate in the improvement of SCSs.

As far as the former is concerned, the good interaction between the service provider and the demand side of the smart community is its inherent attribute. Communities should use modern information technology to improve the construction of such interactive platforms, so that information is interconnected, increasing the source of information access and reducing the difficulty of access, thereby lowering the threshold for residents' participation and promoting more residents to participate in community affairs (Matei, S. *et al.*, 2001). At the same time, with the help of the characteristics of virtual communities, the "strangeness" between residents is eliminated, and the group dynamic mechanism is shaped to promote the activity of residents (Rheingold, 1993), so as to establish a community of mutual care, mutual help, equal exchanges, and democratic consultation in the community (Jiang, 2017).

In the case of the latter, communities need to focus on raising the temperature of smart services. By highlighting the concept of fair and open service in specific services, paying attention to the "key masses", providing personalized smart services, and creating smart services with community characteristics to enhance residents' sense of community, the value orientation of "people-oriented" is highlighted in the whole process of smart services, and then the motivation of residents to participate is activated.

CONCLUSION

Conclusions of the study

In this paper, a resident satisfaction in SCSs model is constructed based on the theory of "expectation inconsistency", and then an empirical study is carried out through SEM analysis. The following research conclusions are drawn:

(1) SCS outcome, ICT infrastructure, and SCS delivery all have a positive influence on resident satisfaction and their performances decrease in turn. (2) some of the factors that drive resident satisfaction most, such as Smart Property Service and Public Facility, have a lower rating. (3) residents are more concerned about the "cost" (including financial and emotional costs) than the quality of the SCSs. (4) Most residents' expectations of SCS are irrational and that’s why it does not have a significant impact on satisfaction. (5) Resident Satisfaction is an important factor in enhancing Resident Confidence in SCS and promoting Resident Participation in improving SCS.

Research Significance and Prospects

This paper has the following research significance: First, based on relevant literature research, combined with the characteristics of SCSs, based on the theoretical model of expectation inconsistency, a model of satisfaction of smart community service residents is constructed, and the empirical paradigm under the issue of smart community is enriched. Second, some of the theoretical findings of this study form a theoretical dialogue with existing research to deepen the understanding of the direction and nature of smart community service. Third, the research results of this study reveal some existing phenomena in the process of smart community construction, and based on the discussion and analysis of the causes of the phenomenon, put forward policy suggestions such as focusing on the publicity of SCSs, paying attention to matching service content with residents' needs, focusing on the integration of online and offline services, and focusing on guiding residents to participate in the improvement of SCSs based on satisfaction and trust, responding to the dilemma of smart community development and providing reference for the practice of smart community construction.

Admittedly, there are some obvious shortcomings in this study: this study takes the form of questionnaires to collect cross-sectional data, and we inevitably doubt whether residents already have clear expectations before receiving services, so there may be endogenous problems between the variables of expectation, quality perception and satisfaction, and further experimental research methods are needed to eliminate the influence of confounding factors and obtain more convincing causal relationships. In addition, due to the resource limitations of the researchers, this study only selected three community residents as samples within the scope of Chengdu City, and obtained 342 valid questionnaires, and there is still room for optimization in the expansion of the sample size.

The outbreak of covid-19 may have created opportunities for the development of the digital society, and the construction of smart communities has become a very valuable topic facing experts in contemporary academic and practical circles. However, as Scott Charleed puts it, "technical complexity is accompanied by the complexity of the organizational structure and the complexity of the performer". How to form a synergy between government departments, between governments and enterprises, and communities, and provide SCSs that make residents more satisfied, will become a problem that we need to further explore.

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