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System quality, users' satisfaction, and citizens' continuous intention to use e-government: an empirical study

Wei SUN[1], Xiaojuan ZHANG[2*]

[1] Ouyeel Company Limited, Shanghai, China
[2] School of Information Management, Wuhan University, Wuhan, China
[*]Corresponding author: xjz@whu.edu.cn; juliazhang2006@yahoo.com
China

ABSTRACT

This paper aims to investigate the factors influencing citizens' continuous intention to use e-government from a composite perspective of system quality and users' satisfaction. For this purpose, the authors first employed Information System Success(ISS) Model and Information system(IS) Continuance Model as theoretical bases to construct a conceptual model for this research and further validated it with the SPSS data analysis tool and AMOS structural equation modeling.

Keywords: System quality, users' satisfaction, ISS, information system continuous use, users' intention

1. Introduction

Promoting social and economic development and public governance by information and digital means has become a global trend. Nowadays, rapidly advancing technologies may transform the original working pattern of all functional areas of the government. Alcaide (2017) believed that E-government enables the citizens to get more information due to its effectiveness and practicality in multiple public service environments, thus improving the transparency and service suppliers as well as motivating the public to more actively participates in government affairs. However, the government is also faced with huge challenges sowing to technological development outpacing the government's response to and use of information and communications technology. E-government is developing itself into a phenomenon with more complicated standards and rules. Builders of E-government systems are seeking solutions for service optimization while the citizens, as users of the E-government system, are seeking better service (Vishanth, 2016). Upon several years of development, and E-government system does not only serve as information display and service provision. Indeed, the public's involvement and feedback have also become an important aspect of E-government optimization. Therefore, the challenges before the government are not only the rapid development and update of information and communications technology but also "how to maintain and continuously improve the public's satisfaction so that their intention to continuously use the E-government system can be improved". (Meng,2004; Verdegem,2009).

In 1992, Delone and McLean proposed the information system success model based on the study of the communication of Shannon and Weaver, Mason's information influence theory, and empirical studies on management information system from 1981 to 1987(DeLone&McLean, 1992). In the subsequent ten years, with the explosive development of electronic information technology, scholars improved and updated the model.

Bhattacherjee and Barfar (2010) held that, in the previous studies, the relevant theoretical knowledge used to explain consumer usage of the information system was improperly used to predict the usage behavior of the information system. Researchers have to employ more suitable models and structures to understand the continuance behavior. Veeramooto (2018) revolved around the prediction of the use of the information system to establish a comprehensive model about the continuous use of electronic documents. He regarded the D&M information system success model and information dissemination theory as the theoretical basis to illustrate the rationality of applying these theories to the field of E-government. He concludes that the confirmation of users' expectations will affect their satisfaction. Valaei et al. (2017) applied expectation confirmation theory and information system success cases, then employed the partial least squares structural equation model (PLS-SEM) to study the citizens' continuance intention when the government turns up new Facebook pages. Dwivedi (2017) established a unified model of E-government adoption (UMEGA) and verified the model based on existing theoretical models of information technology usage.

This paper explores the factors influencing citizens' continuous intention to use e-government from a composite perspective of system quality and users' satisfaction. Employing Information System Success (ISS) Model and Information system(IS) Continuance Model as theoretical bases to construct the conceptual model of this research, the authors further verify the model through the SPSS data analysis tool and AMOS structural equation modeling.

The rest of this paper is structured as the following: Section 2 is for a literature review; The research hypnoses are

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proposed in Section 3, followed by the conceptual model and its validation in Section 4. In Section 5, we concluded this paper.

2. Literature Review

2.1 Related studies: E-government system success and users' satisfaction/continuous use

2.1.1 Users' continuous use intention of E-government systems

It is known that the E-government system can improve work efficiency and provide high-quality information, thus alleviating administration burden and enhancing time efficiency. To achieve the implementation targets of E-government, the citizens have to be motivated to use the E-government service. But to what extent would the citizens use the system is unknown. Users 'continuous use intention of the E-government system has attracted attention from researchers in recent years(Faulkner, 2019). Bhattacherjee (2008) pointed out that the study on information system continuity is designed to promote actual repeated usage. Santhanamery (2018) paid attention to the continuous use behavior of the users after initial usage of the information system, indicating that their use experiences may increase or reduce their future usage of the system. Based on actual E-government applications, Wirtz et al. (2014, 2015) studied the influential factors determining the citizens' satisfaction towards electronic public service and their continuance intention on the use of E-government portals.

2.1.2 E-government system users' satisfaction

In assessing the continuous use of E-government systems, users' satisfaction is always regarded as an important dimension affecting the behavior and intention (Alzahrani, 2017) and the factors affecting the users' satisfaction attract the attention of the researchers. Athmay et al. (2016) explored the key factors for the citizens to make use of E-government service from the perspective of users' satisfaction, aiming to understand citizens' needs for E-government systems and to improve the efficiency of government administration in the United Arab Emirates (UAE) as well. The effect of trust on users' satisfaction was also studied, which concluded that the users' trust would exert direct or indirect effects on their satisfaction (Santa et al., 2019)

2.1.3 E-government system success

It can be concluded from the above studies that the information system success model has been used as the theoretical basis in relevant studies on the intention to continuously use the E-government system. In 1992, Delone and McLean proposed the theory regarding the information system success model. In the subsequent ten years, people interested in such studies gave new explanations and connotations to this model because of its shortcomings (Seddon, 1997) and against different historical backgrounds. In 2003, Delone and McLean put forward a new D&M model (DeLone&McLean, 2003) which re-described the relationships among the six key aspects of information quality, system quality, service quality, use, users' satisfaction, and net interest of success in the information system. Stefanovic (2016) empirically assessed the updated D&M success model. He started from the perspective of a government employee making the administrative duties simpler and more efficient. Stefanovic also assessed the success of an E-government system regarding another study carried out in Malaysia, having considered the demographic characteristics (namely age, gender, income, and education) and users' intention on using the E-government applications. To study the key factors influencing the individual's use of information and communications technology in the E-government environment, Alruwaie et al. (2012) combined the information system success model of Delone and McLean and the E-S-Qual model. Considering the effects of technology, organization, and information system quality as well as combining social recognition theory and expectation confirmation theory they studied the satisfaction about and continuity of use of E-government service and illustrated the cognition, management, and technology factors related to adoption and use of E-government. Rana et al. (2014) examined the success of an online public complaint and compensation system from the perspective of Indian citizens. They studied and assessed factors such as behavioral intention, service quality, information quality, perceived usefulness, satisfaction, and perceived risk. Their study revealed that the success model is one of the few theories and models helping the researchers to determine, after testing and adoption, some significant factors affecting the citizens' acceptance and use of E-government service. Based on the literature on information system success and continuous use, Akram et al. (2019) explored the relationship between technology predictors and usage behavior in explaining users' intention to continue filing tax online. The results show that expectation confirmation and satisfaction are the main causes of continuance intention with electronic taxation. The study also found that the information system success factor exerts an indirect effect on the continuous use intention.

2.2 Theoretical Model

2.2.1 Initial D&M model

Delone and McLean (1992) put forward the information system success model based on practices and applied studies on communications theory and by combining with the information influence theory of the American mathematician Mason together with the MIS theory. they comprehensively measured the success factors of different information systems and proposed a six-factor success model which is shown as follows:

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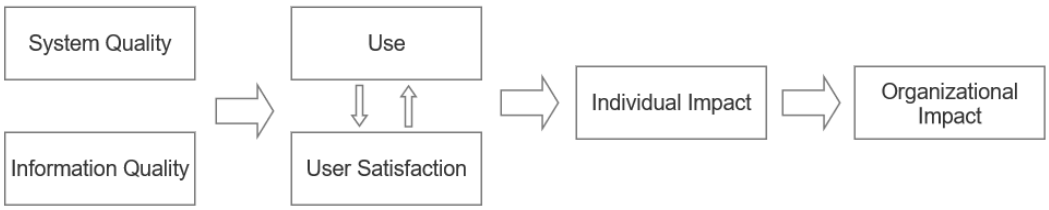

Figure 1 Initial information system success model

2.2.2 Updated D&M model

In 2003, Delone and McLeanput forward a new D&M information system success model. This new model re-identified and re-described the relationship among six key layers of information system success. The net benefit is an idealized comprehensive measurement index and refers to the sum of all past and expected future benefits minus all past and expected future costs generated from using information technology applications. "Use" refers to the use of the system. The manpower spent will be consumed along with the use of the system. "Use" can be measured by the actual working time, time spent on information analysis, use frequency, and the number of users. It can also be measured as a binary variable: use/not use. What information quality discusses is the timeliness and accuracy of relevant information generated by the system. "Perceived usefulness" is a perception index, indicating the extent to which the user believes the use of a particular system improves work efficiency. The positive experience of "use" will lead to the improvement of "users' satisfaction" which will, in turn, cause the increase of "use intention", thus leading to further "use".

The updated model:

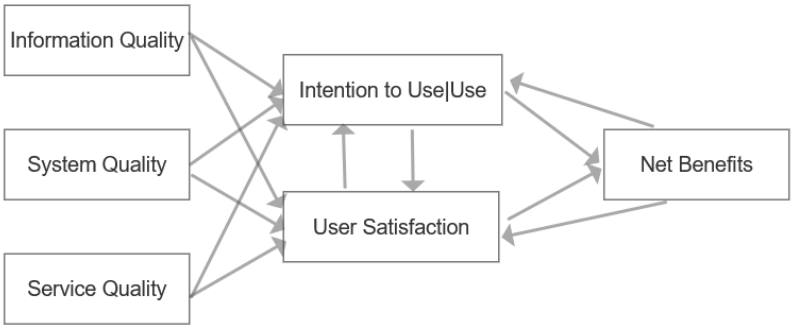

Figure 2 Updated information system success model

2.2.3 Information system(IS) continuous use model

"Continuous use of information system" refers to the behavior that the user will continuously use the E-government information service and system for a longer period after initial usage. Bhattacherjee (2001) proposed the original model of information technology continuity. The proposal of such a model was inspired by the expectation disconfirmation theory (EDT) advanced by the Oliver Marketing Research Center (1980).

Information system continuity is defined as the user's decision to continue to use information technology in the long run while information system acceptability focuses on the user's decision to use the information system for the first time. The idea and train of thought of studying the continuous use of information systems lie in that the obtainment of relevant benefits and improvement of service efficiency through information systems depends more on continuous use. Bhattacherjee et al. (2008) linked the continuity tendency with behavior and proposed the extension of the information technology continuity model. They studied the consumers' satisfaction, post-purchase behavior, and service marketing, proposing an extended model which combines consumer behavior with technology acceptance model (TAM) and constructed a model which bases itself on the consistency between an individual's decision to continuously use information system and the consumer's decision on repeated purchase and reflects the users' expectation for changes after the initial adoption of the information system. This model is called the Expectation Confirmation Model of Information System Continuance (ECM-ISC).

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Figure 3 ECM-ISC model

3. Research Hypotheses

3.1 Relationship between expectation confirmation and users' satisfaction

Confirmation is a cognitive concept (the extent to which the users' expectation on use is realized in the actual course of use) and stems from users' behavior. Oliver put forward the expectation confirmation theory in 1980. Such theory assumes that people form initial expectations on product or service before use and such expectations can predict and study the post-purchase behavior. The user forms expectations on the performance of a product or service after using it for the first time and compares it with his/her initial expectations. This is called confirmation. In terms of the E-government system, the use of E-government service more likely involves post-use expectations, which indicates that the user's perception of the instrumentality of the information system can also be adjusted by the strength of his/her confirmation. Based on the information system continuous use model(Bhattacherjee,2008), we put forward the following hypotheses:

H1: expectation confirmation is positively correlated with users' satisfaction

H2: expectation confirmation is positively correlated with perceived usefulness

3.2 Relationship between perceived usefulness and users' satisfaction

Perceived usefulness refers to the user's perceived role of the information system in helping to improve his/her work efficiency and to accelerate the completion of business. The more obvious the improvement of work and business efficiency, the higher the degree of use the user perceives(Davis, 1989). As an attitude measurement of net realized gains, perceived usefulness is similar to users' satisfaction. In human-machine interaction, availability can be used to clearly define the interaction between the user and the application program interface (Xiao,2007). In perceived usefulness related studies, the degree of information access, time loading, and availability of information content reflect that the factors enhancing the availability of E-government system determine users'satisfaction (Halaris,2007; Huang, 2011).

Therefore, our hypothesis is stated as follows:

H3: perceived usefulness is positively correlated with users' satisfaction

3.3 Relationship between information system quality and use intention

From the perspective of consumers, quality can be defined as the advantages of products or services, reflecting the satisfaction and trust of customers. From the perspective of the E-government information system, quality is reflected in information quality, service quality, and system quality. To improve the public's satisfaction and intention to use the E-government service, the managers and service providers of E-government systems need to develop a system with excellent system quality, information, and service quality.

Veeramooto (2018) explored and discussed the information quality, service quality, and system quality. The information system success model is then applied as the basis to discuss the key significance of these quality indicators in influencing the public's intention to continuously use the E-government information system and their user behavior. Information quality is associated with the timeliness, correlation, accuracy, security, conciseness, completeness, and readability of information generated by the system and whether the information meets personalized needs (Bailey,1983; Mahmood,1985; Bevan,1999; Halaris,2007; Colesca,2008). System quality is linked to reliability, availability, flexibility, usability, user-friendliness, functionality, and response time (Zeithaml, 2002; Yang, 2004; Sharma, 2015). Service quality means the user efficiently browsing, inquiring, and completing various matters when using such service and entails efficiency, empathy, convenience, perceived usefulness, and tangibility (Parasuraman,1985; Rust,1993; Kettinger,1994; McGill,2003; Sung,2005; Hu,2009; Pitt,1995).

As a prerequisite for receiving a good evaluation by the system's users, information quality affects the success of the information system through acting on the strategy of E-government and the realization of institutional benefits (Anderson,1994; Hussain,2015; Chatfield,2013). Halaris et al. (2007) held that accuracy is concerned about the information quality of the information system. Colesca and Dobrica (2008) suggested that to effectively use the service of an E-

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government system, extensive and attractive promotion which accurately aims at the potential users and informs the users that the system can meet their personalized needs should be carried out. Therefore, in the measurement of the information quality, this paper mainly considers the accuracy and timeliness of the information and whether the information meets the personalized needs of the users.

Here we make the following hypothesis:

H4: information quality is positively correlated with the continuous use intention

In a project of Yang and Fang (2004), based on service marketing and conceptual framework of information system management, the most frequently cited service quality dimensions are responsiveness, capability, user-friendliness, and service reliability. In the measurement of system quality, this paper focuses on usability, reliability, and user-friendliness of the interface. System quality is an important determining factor for the improvement of user's use experiences(Bevan,1999). Therefore, this paper assumes that:

H5: system quality is positively correlated with the continuous use intention

Service quality is an important aspect of the construction of a system-oriented at users. Tangibility refers to the physical attributes of a system, such as whether the system is attractive and has the right appearance. Empathy involves the humanistic care and personalized attention given to users by the system(Parasuraman,1985). Kettinger et al. (1994) pointed out that system reliability and empathy received attention from the users. Sharma et al. (2015) demonstrated in their study that the satisfaction generated by the use of the E-government service is decided by the system's responsiveness and efficiency, becoming another important factor for predicting the use of E-government service. This factor is closely connected with the use of E-government service. Therefore, in the measurement of service quality, this paper focuses on the satisfaction of the users' expectations, high efficiency of service, and empathy.

By establishing a citizen loyalty model with government online self-service delivery options, Chatfield et al. proved that service quality and citizen satisfaction can explain the citizen's loyalty to E-government service(2013). Alruwaie et al. adopted the framework combining social theory and expectation theory to study the key factors for use of communications technology in the E-government environment. Their study demonstrated that the quality of E-government service will affect the citizen's satisfaction and continuance usage (2012). Therefore, our hypothesis is stated as follows:

H6: service quality is positively correlated with continuous use intention

3.4 Relationship between users' satisfaction and continuous use

Satisfaction is a post-evaluation of the service by the users and could be positive, indifferent, or negative(Anderson,1994). In the customer satisfaction index model of E-government proposed by Kim et al. (2005), the concept of customer satisfaction covers the satisfaction perceived by the users after using E-government service, the satisfaction in comparison with the expectations, and the feeling in comparison with that in an ideal state(Cronin, 1992). The relationship between users 'satisfaction and their behavior intention was proved and the efficiency improvement brought about by users' satisfaction with the system will directly impact their use behavior (Churchill, 1982; Cronin, 1992; Kim,2005).

Cronin and Taylor (1992) studied the relationship among perceived service quality, consumers' satisfaction, and purchase intention and concluded that consumers' satisfaction motivates the purchase intention. Baroudi (1986) demonstrated through path analysis that "users' involvement" is conducive to improving users' satisfaction, and proved that the users' satisfaction with the system will lead to the more frequent use of it. The more satisfied with the system the users are, the more likely they will continue to use the system. On the contrary, if the system cannot meet the users' needs, their satisfaction will not be enhanced and they will avoid further using the system.

In the course of using an E-government system, the continuous use intention will decide its success. Users' satisfaction is an emotional state, which is similar to the users' continuous purchase intention. It should be pointed out that the users' satisfaction with the E-government system should play a more positive role in the continuous use of the system. Meng (2004) studied and discussed the motivational factors affecting people's continuous use of a website and incorporated the social cognition theory, expectation disconfirmation theory, and the experience and results of continuous use of the information system. The results show that the evaluation of the use results by the users is affected by the confirmation on the previous experiences of system use and their perceived satisfaction, which ultimately promotes the continuous use intention. Therefore, we put forward the following hypothesis:

H7: users' satisfaction is positively correlated with continuous use intention

4 Model Construction and Verification

4.1 Model construction

Based on the above hypotheses, the model of key factors measuring the intention to continuously use the E-government system is shown as follows:

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Figure 4 Model of continuance intention to use e-government systems

4.2 Sample collection

Gender breakdown shows that in the 382 total valid samples of this questionnaire, there are 84 males and 302 females, as shown in the following table:

Table 1 Gender Information Statistics

Distribution		Frequency	Percentage	Effective percentage	Cumulative percentage
	Male	84	21.8	21.8	21.8
	Female	302	78.2	78.2	100.0
	Total	386	100.0	100.0	

By age, the number of samples aged between 20 and 25 is 116, accounting for 30.1% of the total. There are 93 samples aged between 36 and 40 and 88 samples aged between 26 and 30, as shown in the following table:

Table 2 Age Information Statistics

Distribution		Frequency	Percentage	Effective percentage	Cumulative percentage
	20-25	116	30.1	30.1	30.1
	26-30	88	22.8	22.8	52.8
	31-35	68	17.6	17.6	70.5
	36-40	93	24.1	24.1	94.6
	>41	21	5.4	5.4	100.0
	Total	386	100.0	100.0	

The statistics on occupations show that relatively more people, namely 99, are students, accounting for 25.6% of the total sample, followed by corporate employees, which is 78, accounting for 20.2%. 71 are the staff of administrative and public institutions, accounting for 18.4%. The specifics are shown in the following table:

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Table 3 Occupational Information Statistics

Distribution		Frequency	Percentage	Effective percentage	Cumulative percentage
	Student	99	25.6	25.6	25.6
	Teacher	53	13.7	13.7	39.4
	Administrative Institutions	71	18.4	18.4	57.8
	Corporate employees	78	20.2	20.2	78.0
	Factory workers	29	7.5	7.5	85.5
	Others	56	14.5	14.5	100.0
	total	386	100.0	100.0	

The statistics on education show that most of the people filling in the questionnaire have received undergraduate education, with the number as 207, regular college accounting for 53.6% of the total. 98 samples have received postgraduate education, ranking 2nd. And only 54 of them are holders of Special institutions.

Table 4 Education information statistics

Distribution		Frequency	Percentage	Effective percentage	Cumulative percentage
	Junior	4	1.0	1.0	1.0
	senior	23	6.0	6.0	7.0
	Special institutions	54	14.0	14.0	21.0
	regular college	207	53.6	53.6	74.6
	Graduate or above	98	25.4	25.4	100.0
	total	386	100.0	100.0	

4.3 Scale

Variable		Indicator content
Perceived Usefulness	P1	The use of e-government systems has made me feel much more productive
	P2	The e-government system has saved me time
	P3	The e-government system is very useful to me
Information Quality	I1	Through the use of e-government services, I can get the information I need in time
	I2	The information provided by the e-government services is accurate
	I3	The information provided by e-government services is up to date
Service Quality	S1	The e-government service provided me with a timely service
	S2	The e-government system attaches importance to solving my problems
	S3	It can be said that the e-government system has solved my previous problems
System Quality	SY1	E-government system interface design and interactive function are very friendly, good and simple.
	SY2	I find it easy to let the e-government service help me get things done
	SY3	The quality of e-government system design is very high
Expectation confirmation	E1	My experience with e-government systems is better than I thought

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	E2	The e-government system provides better service than I expected before using it
	E3	Most of my expectations were met
User Satisfaction	SA1	After using the government affairs system to do things, I feel very satisfied.
	SA2	The service provided by the government affairs system accords with my individuation demand
	SA3	Overall, using the e-government system has been a very pleasant and comfortable experience for me
Continuance Intention	C1	I won't think twice about using the e-government system again
	C2	I will continue to use the event handling functions and services provided by the e-government system through the government information platform
	C3	I have plans to increase the usage of the e-government system I have used in the past

4.4 Model Verification

4.4.1 Reliability test

This paper adopts the Cronbach α reliability coefficient method. Generally, we mainly consider the internal reliability of the scale, namely whether there is visible internal consistency between various parts of the scale. This is crucial for judging whether a scale can be scientifically used. Failure to reach this reliability standard means that the scale is not reasonable and steady and the questionnaire has to be modified or directly abandoned. The reliability coefficient of a scale should be above 0.8. If it is above 0.9, it indicates that the scale has very good reliability. If it is 0.7 to 0.9, the scale has good reliability; if it is 0.6 to 0.7, the scale is acceptable; if it is 0.5 to 0.6, the scale is not suitable. If the Cronbach's alpha coefficient is below 0.6, the questionnaire should be revised. SPSS can test the reliability of a questionnaire and be used for reliability computation.

Table 5 Reliability Analysis

Scale	Cronbach's Alpha	terms
Perceived Usefulness	.860	3
Information Quality	.764	3
Service Quality	.831	3
System Quality	.831	3
Expectation confirmation	.873	3
User Satisfaction	.868	3
Continuance Intention	.927	3
Total scale	.876	21

4.4.2 Validity test

4.4.2.1 Validity analysis

Since this paper employs factor analysis, the seven variables posited in this study cannot be directly measured. Hence, we set three observable variables for each unmeasurable variable. These variables are relatively highly correlated and the factors have to reflect most of the information covered by the original variables. The validity, namely effectiveness, measures the effectiveness of the results measured by measurement tools or means and the degree of correspondence between the measurement results and the investigation contents. Kaiser-Meyer-Olkin (KMO) plays a very important role in this process. When the KMO value is larger than 0.9, it indicates that it is very suitable for factor analysis. When it is larger than 0.8 but smaller than 0.9, it indicates that it is relatively suitable for factor analysis. When the KMO value is larger than 0.7 but smaller than 0.8, it indicates that it is suitable for factor analysis. When the KMO value is smaller than 0.5, then it indicates that it is not suitable for factor analysis. Hence, we will conduct the KMO and Bartlett spherical significance tests. The results of KMO and Bartlett spherical significance test on the research data with SPSS are shown in the following table:

Table 6 Tests on KMO and Bartlett

Kaiser-Meyer-Olkin		.779
Bartlett's test of sphericity	Approximate chi-square	4, 875.389
	df	210
	Sig.	.000

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It is concluded from the above analysis that the KMO value is 0.779 and the significance of Bartlett spherical test is 0.000, smaller than 0.001, reaching the significance level. This demonstrates that the validity of the data used is good and suitable for factor analysis.

4.4.2.2 Common factor extraction

This paper needs to find out the number of principal component factors according to eigenvalues of factors and the eigenvalues of each factor need to be greater than one. The seven factors involved in this study are accumulated and the calculated result is 78.69%, revealing that the factors explain the research scale of the use of the E-government system very well. The specifics are shown as follows:

Table7 Explanatory table for factor total variance

	Initial eigenvalue			Extract Square sum load			Rotate Square sum load		
	total	Variance%	Cumulative variance%	total	Variance%	Cumulative variance%	total	Variance%	Cumulative variance%
1	6.147	29.270	29.270	6.147	29.270	29.270	2.711	12.912	12.912
2	2.406	11.457	40.727	2.406	11.457	40.727	2.423	11.540	24.451
3	2.317	11.035	51.762	2.317	11.035	51.762	2.386	11.364	35.815
4	1.776	8.457	60.219	1.776	8.457	60.219	2.386	11.364	47.179
5	1.466	6.980	67.198	1.466	6.980	67.198	2.290	10.904	58.083
6	1.311	6.244	73.443	1.311	6.244	73.443	2.271	10.813	68.896
7	1.102	5.248	78.690	1.102	5.248	78.690	2.057	9.794	78.690
8	.653	3.109	81.800						
9	.582	2.773	84.573						
10	.486	2.313	86.886						
11	.412	1.963	88.848						
12	.369	1.759	90.607						
13	.312	1.485	92.092						
14	.284	1.354	93.446						
15	.273	1.301	94.747						
16	.254	1.211	95.958						
17	.230	1.094	97.052						
18	.202	.964	98.016						
19	.175	.831	98.847						
20	.156	.743	99.591						
21	.086	.409	100.000						

4.4.2.3 Common factor naming

To extract the information of the original scale to the maximum extent and explain the extracted variables, the rotation method is adopted for analysis. This paper adopts orthogonal rotation and the results are as follows:

Table 8 Factor load matrix after orthogonal rotation

Continuance Intention	Expectation confirmation	User Satisfaction	Perceived Usefulness	System Quality	Service Quality	Information Quality
.092	.032	.072	.882	.036	.042	.161
.037	.015	.061	.852	.003	.064	.242
.059	.094	.108	.855	.119	-.098	.025
.132	.185	.109	.231	.164	.054	.681
.142	.193	.124	.094	-.006	.087	.832
.060	.035	.040	.136	.190	.102	.793
.096	.083	.091	.036	.796	.212	.122
.068	.223	.065	.104	.801	.214	.172
.062	.159	.123	.039	.846	.078	.057
.077	.142	.128	-.016	.141	.806	.028
-.020	.113	.107	.055	.177	.854	.108
.296	.016	.084	-.038	.161	.811	.118
.138	.824	.141	.060	.181	-.008	.112
-.021	.870	.190	.036	.091	.137	.162
-.027	.846	.134	.058	.188	.172	.125
.152	.172	.845	.106	.117	.071	.076
.128	.116	.849	.020	.067	.181	.101
.093	.165	.849	.135	.100	.076	.088
.930	.014	.130	.087	.113	.102	.090
.882	.023	.110	.045	.034	.114	.101
.914	.054	.123	.071	.074	.076	.124

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Table 9 Factor model construct validity scale

Latent variable	Measurement term	Factor load	C.R.	P	Combination reliability	AVE
Perceived Usefulness	P1	0.91			0.866	0.684
	P2	0.822	18.134	***		
	P3	0.741	16.609	***		
Expectation confirmation	E1	0.77			0.876	0.703
	E2	0.892	18.025	***		
	E3	0.849	17.527	***		
Information Quality	I1	0.716			0.785	0.55
	I2	0.827	13.237	***		
	I3	0.674	11.953	***		
Service Quality	S1	0.765			0.843	0.641
	S2	0.795	15.647	***		
	S3	0.84	16.063	***		
System Quality	SY1	0.742			0.839	0.635
	SY2	0.874	15.527	***		
	SY3	0.769	14.685	***		
User Satisfaction	SA1	0.852			0.87	0.691
	SA2	0.822	18.253	***		
	SA3	0.819	18.162	***		
Continuance Intention	C1	0.954			0.937	0.832
	C2	0.837	17.192	***		
	C3	0.941	19.862	***		

The analysis' results demonstrate that the questionnaire model is comprised of seven factors and 21 questions. The standardized factor load value of each measurement item is greater than 0.5, the critical ratio is greater than 1.96 and all of them are significant at the level of 0.001. Also, the composite reliability of each factor is greater than 0.7, indicating that the model has good composite reliability. The average variance extraction value (AVE) of each factor is greater than 0.5, indicating that the model has good convergent validity.

Table 10 Checklist of discriminant validity of latent variable

Ave squared	Expectation confirmation	Information Quality	Service Quality	Continuance Intention	Perceived Usefulness	System Quality	User Satisfaction
Expectation confirmation	0.827						
Information Quality	0.424	0.838					
Service Quality	0.449	0.381	0.742				
Continuance Intention	0.336	0.323	0.192	0.797			
Perceived Usefulness	0.449	0.337	0.077	0.335	0.801		
System Quality	0.156	0.329	0.242	0.253	0.352	0.831	
User Satisfaction	0.151	0.391	0.197	0.439	0.321	0.347	0.912

The above table shows that the positive square root of the minimum average variance extraction value (AVE) of latent variables is 0.742, greater than the maximum correlation coefficient 0.449, demonstrating that there is a good discriminant validity between two latent variables.

In conclusion, the questionnaire structural model has both good composite reliability and construct validity and a relatively high degree of agreement with the actual data. The questionnaire model has passed the confirmatory factor analysis test, meaning the questionnaire and dimensions are set reasonably.

4.4.3 Correlation analysis of variables

To explore and study the correlation between various variables, we conducted a correlation analysis of the seven variables.

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Table 11 Variable Correlation Analysis

		Continuance Intention	User Satisfaction	Perceived Usefulness	Information Quality	Service Quality	System Quality	Expectation confirmation
Continuance Intention	Pearson correlation	1	.102*	.072	.123*	.232**	.102*	.184**
	Significance (bilateral)		.046	.160	.016	.000	.046	.000
	N	386	386	386	386	386	386	386
User Satisfaction	Pearson correlation	.102*	1	.142**	.354**	.329**	.396**	.371**
	Significance (bilateral)	.046		.005	.000	.000	.000	.000
	N	386	386	386	386	386	386	386
Perceived Usefulness	Pearson correlation	.072	.142**	1	.388**	.095	.009	.142**
	Significance (bilateral)	.160	.005		.000	.061	.867	.005
	N	386	386	386	386	386	386	386
Information Quality	Pearson correlation	.123*	.354**	.388**	1	.324**	.206**	.367**
	Significance (bilateral)	.016	.000	.000		.000	.000	.000
	N	386	386	386	386	386	386	386
Service Quality	Pearson correlation	.232**	.329**	.095	.324**	1	.299**	.448**
	Significance (bilateral)	.000	.000	.061	.000		.000	.000
	N	386	386	386	386	386	386	386
System Quality	Pearson correlation	.102*	.396**	.009	.206**	.299**	1	.254**
	Significance (bilateral)	.046	.000	.867	.000	.000		.000
	N	386	386	386	386	386	386	386
Expectation confirmation	Pearson correlation	.184**	.371**	.142**	.367**	.448**	.254**	1
	Significance (bilateral)	.000	.000	.005	.000	.000	.000	
	N	386	386	386	386	386	386	386

*. means that there is a significant correlation at the level of 0.05 (both sides).
**. means that there is a significant correlation at the level of .01 (both sides).

The results of the correlation analysis of variables show that there is a significant positive correlation between the continuous use intention and the users' satisfaction and the correlation coefficient is 0.102. The results also demonstrate that there is a significant positive correlation between the continuous use of intention and information quality, service quality, and system quality. Meanwhile, there is a significant positive correlation among the users' satisfaction, perceived usefulness, and expectation confirmation. We further carried out path influence analysis of the structural equation model to study the influence of various variables.

4.5 Structural equation model

We constructed a structural equation model following relevant theoretical studies of the E-government information system and the seven hypotheses put forward in this paper. The model is shown in the following figure:

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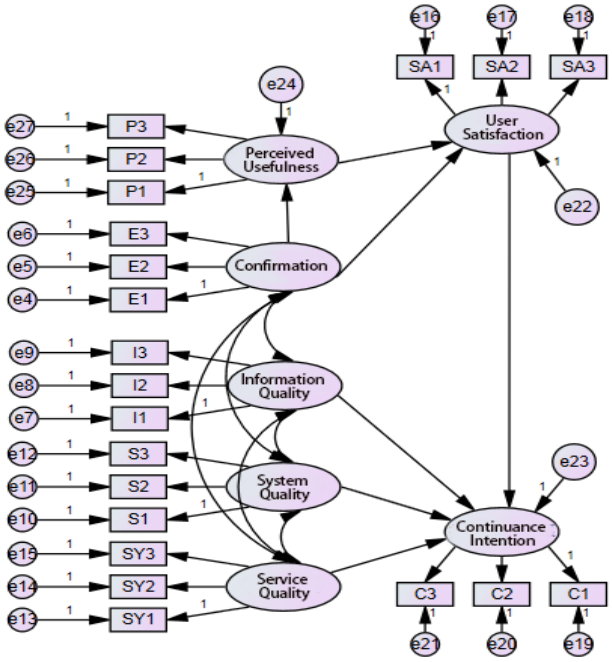

Figure 5 Structural equation model of key factors of E-government users' continuous use intention

4.6 Hypotheses verification

This study employs the software AMOS 21.0 and adopts the maximum likelihood method for confirmatory factor analysis and verification of the construct validity of the model and the scale. When applying confirmatory factor analysis to evaluate the goodness-of-fit of the model, it is necessary to consider many indices such as absolute fit indices, incremental fit indices, and parsimonious fit indices. Therefore, the values to be calculated include CMIN/DF, SRMR, RMSEA, GFI, IFI, RNFI, and so on.

Based on the relationship among various indices in this paper, a confirmatory factor analysis model is constructed and the goodness-of-fit of the model after optimization and correction of the error terms is shown in the following table.

Table 12 Global goodness-of-fit analysis

Fitness Test Index	Fitness Standard	Model result	Conclusion
CMIN/DF	1-3	2.544	Good
RMSEA	< .08	0.063	Good
SRMR	< .08	0.073	Good
GFI	> .90	0.906	Good
CFI	> .90	0.946	Good
IFI	> .90	0.946	Good
PNFI	> .50	0.727	Good

The results show that the chi-square ratio of degree-of-freedom is 2.544. Being under3.000, it indicates the model has good goodness-of-fit. The standard path coefficient of the model obtained after the organization and analysis of the operation results is shown in the following table.

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Table 13 model standard path coefficients

Path relation			Standard Path Coefficient	standard error	C.R.	Significance P
Perceived Usefulness	<---	Expectation confirmation	0.167	0.078	2.944	0.003
User Satisfaction	<---	Perceived Usefulness	0.168	0.048	3.136	0.002
User Satisfaction	<---	Expectation confirmation	0.436	0.071	7.644	***
Continuance Intention	<---	Information Quality	0.195	0.073	3.152	0.002
Continuance Intention	<---	Service Quality	0.17	0.068	2.8	0.005
Continuance Intention	<---	System Quality	0.023	0.069	0.374	0.708
Continuance Intention	<---	User Satisfaction	0.217	0.051	3.999	***

* * * Means P value is less than 0.001; significance level is 0.05

5. Conclusion

The findings of this study are of varying significance in research and practice.

First of all, since perceived usefulness is an important prerequisite for improving the users' satisfaction, it plays an irreplaceable role in improving the users' continuous use intention. Builders of E-government systems can improve the performance and effectiveness of the system to enable users to spend less time using the system and improve their work efficiency.

Secondly, after using the system for the first time, perceptions about the quality of the information system would emerge. When these perceptions are confirmed, they would develop into a sense of satisfaction or dissatisfaction, thus affecting users'future behavior regarding using the system. Therefore, expectation confirmation not only directly acts on the improvement of satisfaction but can also affect the perceived usefulness to indirectly act on the improvement, thus further deciding users' intention to continuously use the information system.

Thirdly, information quality, system quality, and service quality are the important determining factors for improvement of the intention to continuously use the information system. Therefore, in the course of E-government system design, information quality should be regarded as an important issue. When the users believe that the information provided by the system is clear, understandable, highly related, and accurate, they are more likely to use the system again. The role of service quality is particularly significant. The importance given to service quality coincides with the government's "public-centric" concept. The construction of an E-government system should not deviate from the purpose of serving the public and should be targeted at the ultimate goal of improving the citizens' satisfaction and service efficiency, thus increasing the frequency of use. On such a basis, the builder of an information system should develop a system that can guarantee rapid responsiveness, has user-friendly interfaces and focuses on the personalized needs of the users so that the users feel they are cared about. It is necessary to investigate the factors affecting whether the users will continuously use the system so that the developers and operators of E-government systems can more effectively improve the users' satisfaction from the perspectives of system quality and actual usage, and increase re-use of the E-government system.

The findings of this study demonstrate that if the system developers take the improvement of users' satisfaction and continuous use intention as the goal of E-government system construction, they need to consider both system quality and users' satisfaction. In the E-government environment, the users pay more attention to whether the information provided by the E-government system is of high quality, whether their psychological expectations before using the E-government system are met, whether they receive delight full quality service in using and their problems have been well solved by using the E-government system.

This study has the following limitations. Although samples of different ages, occupations, and educational backgrounds have been collected as far as practical, the samples are still deficient in representativeness due to regional limitations. In addition, the study has not considered the expansion of the model. For instance, the theory of citizen trust

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and attribution theory have not been included. Such are important aspects requiring further attention in future studies.

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