Innovate Framework to Evaluate Security of E-Government to Improve Intention to Use Trust

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Abstract: - This paper aims to measure the users' intention to use e-government services, by selecting innovative ways to protect the e-government services. Potential factors represent frame works that measure intention to use were formed as a result of the literature survey carried out in four related areas: confidence, quality assurance, security, and trust. The demographic information and four hypotheses for users' intention to use factors were tested by a self-structured questionnaire designed into two sections, the first section measured the demographic information, and the second section consists of 18 statements distributed into four dimensions. The number of respondents was 371. The findings indicate there is statistically significant effect of the confidence; quality assurance, security, and trust on users' intention to use e-government services, the age, and experience have no statistically significant effect on intention to use e-government services. E-Government trust need to improve and enhance the security level in a regular schedule to increase users' intention to use is recommended.

1 Introduction

E-governments (electronic governments) security, control the intention of the users, who do their different transactions through Internet; therefore, the problem that appears here significantly is about the security level in the network system of e-government, since users can trust e-government services by determining the level of security. Evaluating the user's satisfaction in using e-government services will give feedback to the e-government managers and developers, an information about the weak points in the e-government network, by measuring their trust in using the services of e-government as well as measuring the quality assurance and user's satisfaction for these services.

E-governments mainly aim to provide citizens with different services. For this aim, the e-governments databases contain huge amounts of citizens' personal data. Therefore, the system of e-governments gives a high attention for the security issues through the network system of e-governments, as an approach to avoid any unauthorized access or use for the personal data of citizens [1]. However, lack of access to e-government information is a challenge that can affect trust between citizens and government [2], [3].

The significance of focusing on the security issues related to the e-governments care about protecting the personal information and data for the citizens. The security of computer networks defined as the process of protecting the information or data by controlling the access to the databases of the critical data; therefore, citizens can interact with e-governments in a safe way without any interruption from those unauthorized people such as hackers [4], [5].

According to Almarabeh and Abu Ali [6], the Information and Communication Technologies (ICT) were developed widely; therefore, this development has reached different fields such as the industrial, economical, and educational fields. Nikkhahan, Aghdam, and Sohrabi [7] argued that e-governments have identified the significance of the security issues in protecting the citizens' personal information from any threats that are provided by unauthorized access such as the professional hackers. E-governments realize the significance of security and vulnerability issues. Vulnerabilities are the weaknesses in process, administration, or technology that allow malicious entities access the computer system [1].

Security is the most important factor that motivates users to use e-government applications without any fear, therefore the e-government developer looking for solutions to avoid any vulnerable issues that can lead to the unauthorized access personal information of the citizens or the information of the government itself [8]. Security is an important factor can measure the level of success that e-government have reached [9], [10].

Building the bridges of trust, transparency, efficiency, and effectiveness of the e-government applications are considered with securing the personal information that users provide to them in a proper way that are out of reach those unauthorized people. From this point, the motivation of this paper is "how to innovate ways to increase users' intention to use e-government services by improving trust" it was derived with help of literature related to e-government intention to use [11], [12], [13].

Intention to use e-government services is a crucial challenge not only in e-government, but also in the environment of the public sector to manage and develop reliable and trustworthy services. The trust of using e-government services depend mainly on the computer network security. Thus, the main objective of this paper is evaluating users' intention to use e-government services.

This paper consists of five sections. After the introduction, the theory and research background introduced. Next, research model and data collection are provided in the third section. The fourth section describes research findings. Finally, research results are discussed, and conclusion is introduced.

2 Theory and Research Background

According to the Australian National Audit Office [14], every e-governmental department seeks to maintain on the security and safety issues within their performance to guarantee the users' satisfaction and acceptance of the governmental services. Both developed and developing countries are using e-governments to provide fast and low-cost services applications to their citizens [15].

Security is the significance factor in the services of e-governments because it provides the trust to the citizens [16], [17]. Security represents the main key for achieving the development in the services of e-governments. It revolves around major concepts such as availability, integrity, and confidentiality [18].

According to United Nations Department of Economics and Social Affairs in 2007 [19], vulnerability considered as the capability of e-governmental system to change according to the events that occur in the system. The role of network's security management is to decrease the risks of system's failure, keep the component of networks in safe as software and data, support infrastructure and maintain the availability of data services, and prevent any vulnerability [20], [21].

The vulnerabilities issues are considered as the main barrier in the process of enhancing networks' performances and reduce the number of users, who utilize the services of the network. Zhao et al. [22], Stone [23], Upadhyaya, Shakya, and Pokharel [24], explained that the vulnerability issues come after having personal information or folders from citizens, and then take the required procedures to protect the folders and information that e-governmental systems have. E-government concentrates on the trust that their citizens provide towards the e-governmental services [10].

There are many studies, that measured factors related to the e-government users' trust. Alsultanny [25], provided a guideline to enhance information network security by applying risk management process to support decision-making process by using risk-based method for e-government, and the main obstacles for using e-government are the securing of data and computer network. Kitsing [26] in his study found out that the governmental sector in Estonia showed more positive responses and benefit from the e-government comparing with private sector, due to the trust in the e-government computer network security. Adeyemo [27] compared the results of collecting data related to the Nigerian e-government, his results appeared that the global survey ranked Nigerian e-government in low level, but the collected data showed that the users trust the Nigerian e-government, and there are very strong communication and ICT, which improve the situation and the rank of Nigerian e-government.

E-governments deal with some vulnerability issues to avoid this problem and provide safe environment to citizens [28]. Trust in e-governmental applications is considered an important factor that governments concentrate on, because it motivates citizens to do their different transactions without facing any problems in recording their personal information [29].

3 Research Model and Data Collection

The innovative framework for this study is the research model, that can improve user's intention to use e-government services to increase their trust, this model that guides this study is depicted in Fig.1 this model consists of four dimensions, the first dimension concerning *confidence* provided to the

users through the e-government network. The second-dimension *quality assurance* concerning the quality assurance of the services provided to the users, the third dimension is *security*, which is an important dimension that effect on user satisfactions, and the last dimension is the *trust*, which is also important in directing users to use e-government services. This model examines the effect of *confidence, quality assurance, security,* and *trust on* e-government *users' intention to use*.

The hypotheses of this paper are;
H1: There is statistically significant effect of *confidence* on e-government *users' intention to use.*
H2: There is statistically significant effect of *quality assurance* on e-government *users' intention to use.*
H3*:* There is statistically significant effect of *security* on e-government *users' intention to use.*
H4: There is statistically significant effect of *trust* on e-government *users' intention to use.*
H5: There are statistically significant effect of *demographic information* (*age, qualification*, and *experiences*) on *confidence, quality assurance, security,* and *trust.*
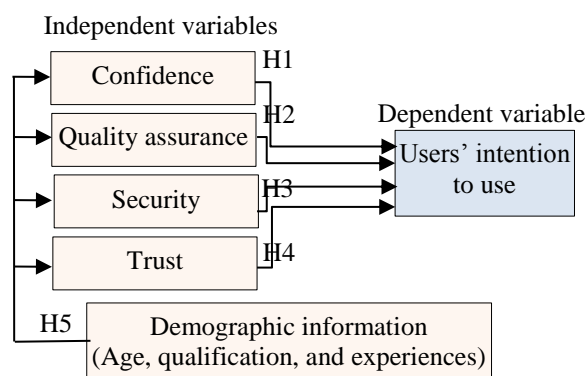

Fig.1. The research model conceptual

This research used the quantitative approach, this kind of research helps to collect data and analyze it mathematically. This approach can provide findings that can be converted into statistics and give precise and accurate results [30].

The questionnaire divided into four dimensions of 18 statements. The statements of the questionnaire were rated by the 5-point Likert-scale where; Strongly Disagree (SD)=1, Disagree (D)=2, Neutral (NU)=3, Agree (A)=4, and Strongly Agree (SA)=5. The population of this study was the e-government users in the Arab Gulf region (Bahrain, Saudi Arabia, United Arab Emeries, Oman, Qatar, and Kuwait); the number of respondents is 371.

Validity analysis was contacted to ensure content validity, and the questionnaire piloted by interview with 6 university professors and experts in the field of service security. They were asked to evaluate the

content regarding the language, accuracy, completeness, and clarity. The reliability carried out by using Cronbach's alpha to measure the internal consistency of a construct. They recommended minimum acceptable limit of reliability "alpha" for exploratory study is 0.26 [31]. The results of testing Cronbach's of the entire dimensions equal 0.935 and the H2 values of the dimensions (*Confidence, Quality assurance, Security*, and *Trust*) are above 0.7, these indicating the questionnaire have good internal consistency.

4 Research Findings

The normal distribution test by Kolmogorov-Smirnov was applied, the results of testing showed the normal distribution of the statements of the questionnaire, the sig values for each statement in the questionnaire are > 0.05. The results of Levene's test for homogeneity showed that the collected data from responds are homogenous because each statement has sig values are >0.05.

The first part of the questionnaire collected information about the respondents' background. Table 1 shows the highest number of the study sample is between 35 to less than 45 years old represent164(44.2%). For qualification most of them are carrying BSC degree 211(56.9%), and 107(28.8%) of respondents have 1 to less than 5 years' experience of using e-government services.

Table 1: Respondents' demographic information

Demographic Information	Type or group	Frequency	Percent
Age	Less than 25 years	54	14.6
	25 to less than 35 years	101	27.2
	35 to less than 45 years	164	44.2
	45 years and above	52	14.0
Qualification	High school and technical diploma	68	18.3
	BSC	211	56.9
	MSC and PHD degrees	92	24.8
Experience	Less than one year	102	27.5
	1 to less than 5 years	107	28.8
	5 to less than 10 years	89	24.0
	10 years and more	73	19.7

Table 2 shows the descriptive statistics: averages, standard deviations, and rank (the rank represents the most important dimension depending on average) to the 18 statements of the questionnaire were measured the intention to use e-government. From the table the following appears:

i. The average of the 1st dimension measured the *confidence* of using e-government services is 3.370. It takes rank four.

ii. The average of the 2nd dimension measured the *quality assurance* of using e-government services is 3.427. It takes rank three.

iii. The average of the 3rd dimension measured the *security* of using e-government services is 3.540. It takes rank two.

iv. The average of the 4th dimension measured the *trust* of using e-government services network is 3.514. It takes rank one.

It was found that there is positive intention to use e-government services, because averages of all statements of the four dimensions are above the weighted mean (3).

Table 2: Averages, standard deviations, and ranks of the four dimensions

No.	Statements	Average	Std*	Rank
S1	I have enough confidence on the security of the e-government services.	3.460	1.132	
S2	I consider my personal information, fully-protected against any possible attack.	3.404	1.133	
S3	The feedback and suggestions I provide will have a large effect on the protection of information.	3.425	1.096	
S4	E-governmentservices sometimes present "out-of-service" message because of a presumed attack.	3.177	1.105	
S5	Sometimes I receive fake emails from e-government website.	3.382	1.095	
First dimension average: *confidence*		**3.370**	**0.814**	**4**
S6	The website is user friendly.	3.355	1.121	
S7	The website is well designed.	3.466	1.105	
S8	The website is easily accessed and used by mobile phone.	3.363	1.036	
S9	I can easily contact the e-government organization through the website.	3.522	1.058	
Second dimension average: *Quality assurance*		**3.427**	**0.848**	**3**
S10	The e-government guarantees that various systems and data are available for people who are permitted to access it.	3.372	1.160	
S11	The e-government guarantees that the information is not being tampered with.	3.584	1.115	
S12	The e-government guarantees that when information is delivered to a specified recipient, then the sender and the recipient cannot reject receiving or sending this information.	3.619	1.069	
S13	The e-government guarantees maintaining the secrecy of the user's identity while logging in by asking some personal questions and entering ID number.	3.587	0.994	
S14	The e-government guarantees that there is technical infrastructure that produces trust and makes it observable to the user's community.	3.539	1.063	
Third dimension average: *Security*		**3.540**	**0.756**	**2**
S15	The e-government data and services are isolated and must be reorganized in business events groups.	3.547	1.052	

S16	Possibilities that are provided by the e-government are not totally recognized by users.	3.544	1.060
S17	The utilization of various services of the e-government has completely shortened the procedures of personal transactions with the rest of governmental sectors.	3.420	1.055
S18	I am completely satisfied and trust all the services provided by e-government website.	3.543	1.112
Fourth dimension average: *Trust*		**3.514**	**0.855**	**1**

Std*: Standard Deviation

To test hypotheses, two statistical tests were carried One Sample T-Test and One Way-ANOVA. To test hypotheses (H1, H2, H3, and H4) related to the four dimensions in the questionnaire. One sample T-test was used to test these hypotheses. Table 3 shows that for H1 (T=8.764), H2 (T=9.693), H3 (T=9.693), and H4 (T=11.575), the sig values to the four hypotheses are 0.000. In this case, all the hypotheses are statistically significant at .05 level. It is quite clear there are significant effects of (*confidence, quality assurance, security*, and *trust*) on *intention to use e-government services*.

Table 3: One sample T-test for (H1, H2, H3, and H4) hypotheses

(Test value = 3)							
Hypothesis no	N	Average	Std	Standard error mean	T	df*	Sig.**
H1	371	3.370	0.813	0.042	8.764	370	0.000
H2	371	3.427	0.848	0.044	9.693	370	0.000
H3	371	3.540	0.756	0.039	9.693	370	0.000
H4	371	3.514	.855	0.044	11.575	370	0.000

*df: degree of freedom; **Sig: Significance

The last hypothesis H5 measured the effect of the demographic information (*age, qualification, and experience*) of respondents on the four dimensions (*confidence, quality assurance, security,* and *trust*).

Table 4 shows the results of testing by One-Way ANOVA. The results showed that the age and experience have no statistically significant effect on the four dimensions since all the p-value are higher than the significant level 0.05, this indicates that e-government services are important to user' regardless to their age or experience.

For qualification, the results showed that the qualification has no statistically significant effect on the users' responses on the dimensions "*confidence, quality assurance, and security*" since all the sig>0.05. On the other hand, qualification has a statistically significant effect on the dimension "*Trust*" since its value is 0.000; this indicates that qualification influence *trust*, to find out the group causing these differences, Scheffe test showed that,

the respondents who carrying high school or less cause these differences. This indicates that people who have low level of education their trust for using e-government services are very low.

Table 4: One-Way ANOVA test for demographic information

Dimension	ANOVA for age					ANOVA for qualification					ANOVA for experience				
	SoS	df	MS	F	Sig.	SoS	df	MS	F	Sig.	SoS	df	MS	F	Sig.
Confidence	3.53	3	1.17	1.78	0.14	2.33	2	1.16	1.76	0.17	1.55	3	0.51	0.78	0.50
Quality assurance	3.53	3	1.17	1.64	0.17	1.547	2	0.77	1.07	0.34	3.84	3	1.28	1.79	0.14
Security	4.13	3	1.37	2.44	0.06	1.547	2	0.77	1.07	0.34	1.38	3	0.46	0.80	0.49
Trust	3.89	3	1.29	1.78	0.14	11.67	2	5.83	8.28	**0.00**	4.79	3	1.59	2.20	0.08

MS; Mean Square
SoS: Sum of Squares

5 Discussion and Conclusion

The study held to achieve the aim of this research paper; users' intention to use e-government services. A questionnaire was designed to collect data. The sample covered 371 users of e-government services in the Arab gulf region.

The results of the innovative model showed positive effect of (*confidence, Quality assurance, Security*, and *Trust*) on intention to use e-government services. These results are corresponding with the studies of Alsultanny [13] Upadhyaya, Shakya, and Pokharel [24], which conclude that good management of computer networks increases the performance of networks and provides the required quality and security for the data. The results also corresponding with the studie of Nikkhahan, Aghdam, and Sohrabi [7], which found a significant effect of security and protecting the users' personal information on trust from any threats that are provided by unauthorized access such as professional hackers.

The demographic information age and experience have no statistically significant effect on intention to use e-government services, this indicates services of e-government are important to all users regardless to their age or experience in using Internet. According to the qualification all the dimensions showed no statistically significant effect exempt the dimension of *trust,* this indicate that high qualification lays a vital role for intension to use e-government services.

The study recommends to updating the system in a regular schedule, utilizing high security elements, increasing the users' satisfaction, and keeping up to date with the last technological developments will enhance user's intention to e-government services. The results of this research paper can help managers and decision makers of e-government to improve users (*confidence, Quality assurance, Security*, and *Trust*) as a priority in designing e-government services. The feedback to the managers and decision makers for users' intention to use e-government are very important to them and this feedback are usually coming from research results like the results of this paper or similar papers.

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