



International Journal of Economic Research

ISSN : 0972-9380

available at <http://www.serialsjournal.com>

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Volume 14 • Number 16 • 2017

Assessment of e-Government Services from the Supply Side to the Demand Side: Towards Better e-Services in the Kingdom of Bahrain

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Abstract: There is currently a significant trend toward measuring the success of e-government developments for the better satisfaction of stakeholders. In the Kingdom of Bahrain, many initiatives have been formulated to leverage the quality of governmental electronic services including the establishment of robust measures that provide valuable indications of satisfaction with government e-services from the perspective of stakeholders. Therefore, the current study aims to develop a recognized model based on ACSI for measuring the customer satisfaction index for the e-services in the Kingdom of Bahrain (BHCSI). For this purpose, the key factors affecting customer satisfaction with e-services will be identified. Moreover, the BHCSI will be explored for e-services at different levels using the developed model. In view of these aims, questionnaires were developed and distributed to three different types of stakeholders (residents, business and government). The main finding of this research is that the e-services provided by the iGA are accepted and used by individuals with various ages, gender, nationality and education due to the huge efforts provided by iGA to transform the Kingdom of Bahrain into a digital society and economy. Moreover, reaching a customer index (BHCSI) of 79.4 is another achievement for this small country. Many countries have failed to reach this high score, and it is therefore an outstanding accomplishment and indication of success for the iGA and the Kingdom of Bahrain.

Keywords: e-Government, e-services, Satisfaction, Customer Satisfaction Index, Perceived Quality, Image, Trust, Complaints, Participation, BHCSI

1. INTRODUCTION

E-governments have been in operation for the last decade. Due to the increasing power of ICT, governments are now able to deliver services at different levels and for different stakeholders. Effective e-government services can provide a wide variety of benefits, including greater efficiency and savings for governments and businesses, increased transparency and greater participation of citizens in political life (European

Commission, 2014). E-government in the developed countries is at various stages, and developed economies have reached more advanced stages than developing countries. E-governments cannot achieve the full range of expected benefits unless they are accepted and appreciated by the majority of their stakeholders. Therefore, to monitor the progress of e-government development, it is important to define a set of robust and relevant indicators for the awareness and usage of e-services, and customer satisfaction and performance. These indicators become useful as input for the formulation of policies and strategies for effective e-government services. While data from website surveys are available for most countries through the efforts of UNDESA and the European Union, comparable e-government indicators from other surveys are very limited (Economic Commission for Africa and African Union Commission, 2014). In their 2014 survey report, the UN emphasized that the leveraging of e-government to deliver development impacts depends on the effective usage of these services. While the provision of e-government services on the supply side is generally increasing, similar and equal improvements are also needed on the demand side of the equation. This supports the view of Holland *et al.* (2005) that the measurement of e-government must take account of more than just the 'supply side' that is, measuring e-government from the government's perspective. The demand side of e-government is concerned with measuring services from the users' perspectives, including their usage, satisfaction, impacts etc.

Based on an intensive review of the previous efforts made towards measuring and assessing the performance and the customer satisfaction of the e-services provided by the Information and e-Government Authority (iGA), it has been observed that there vital attempts have been made towards developing well-organized approaches to measure critical parameters of customer satisfaction. This can be observed from the huge amount of data collected and the wide variety of descriptive analyses of different aspects of e-government functions, including different services, channels and stakeholders. The iGA depended for a long time on measurements of the customer satisfaction score which were based on a descriptive analysis of certain items of customer satisfaction with the different aspects of e-services. However, e-government services around the world have reached a high level of maturity, impacted by the fast development of ICT, necessitating more advanced and reliable approaches to measurement in order to obtain more detailed results and tackle new areas. The current methods have several drawbacks, such as a lack of provision for an international benchmark for the authority. A more reliable and valuable measurement of customer satisfaction is required, based on theory and international measurements; an index, rather than a score. Customer satisfaction needs to be based on a recognized international standard such as the American Customer Satisfaction Index (ACSI), Customer Satisfaction Index for Singapore (CSISG), Hong Kong Customer Satisfaction Index (HKCSI) or Swedish Customer Satisfaction Index (SCSI). Therefore, the purpose of this study is to develop a recognized model based on ACSI for measuring the customer satisfaction index for the e-services in the Kingdom of Bahrain (BHCSI). For this purpose, the key factors affecting customer satisfaction with e-services will be identified. Moreover, the BHCSI will be explored for e-services at different levels using the developed model.

The findings of the current research will be greatly beneficial for the Kingdom of Bahrain. This work develops, for the first time in the region, a BHCSI that not only measures customer satisfaction with e-services, but which can also be benchmarked using other international indexes such as the American CSI. Furthermore, this research will enable iGA to share their CSI experience with other e-government authorities in the Gulf Corporation Council (GCC); in the long term, this should lead to the development of a GCC-

wide CSI. A focus on the demand side of e-services is also an important aspect of this research. As a theoretical contribution, this research will enrich the theoretical literature and knowledge with a new CSI model that can be adopted by other researchers in the field and contextualized for countries with a similar background and nature.

2. RESEARCH BACKGROUND

2.1. E-Government in the Kingdom of Bahrain

The journey to provide government services electronically was launched with the establishment of the iGA in August 2007 by a Royal Decree. iGA's aim has been to coordinate and implement e-government programs in accordance with the strategies, plans and programmes set out by the Supreme Committee for Information and Communication Technology (SCICT), chaired by the Deputy Prime Minister.

Among the many tasks that iGA undertakes is the proposal of public policy, suitable legislation and decisions on the implementation of the e-government programs and the necessary information technology and data programs. This is achieved by providing services, facilitating communication between all the state's organizations, creating electronic channels to provide e-government services, and providing technical and scientific support to ministries and other government organizations. The iGA's portal, "www.bahrain.bh", aims to provide a one-stop shop to facilitate the utilization of and access to the various government services available electronically.

The Kingdom of Bahrain's first e-government strategy (2007–2010) focused initially on the integration of the government's efforts to provide better and faster services to citizens. The most prominent accomplishment over this period was that the Kingdom of Bahrain ranked as a world leader in the field of e-government in the 2010 United Nations Global e-Government Survey. In this survey, the Kingdom achieved first place in the Gulf, Arab countries and the Middle East, third place in Asia, and 13th worldwide, compared to 42nd in the previous survey. Furthermore, more than 203 e-services launched across multiple channels, namely the e-government portal, mobile portal, service locations, e-government kiosks and a National Contact Centre (NCC).

In May 2012, iGA announced its new national strategy, which extends until 2016; this formed an important step in the journey of e-government towards promoting the development of the Kingdom in the field of e-services on a global level. The new strategy entails more than 90 initiatives, to be launched throughout the four-year strategy. It includes, but is not limited to, the issuance of legislations and regulations contributing to the creation of a safe electronic environment, the development of advanced technological infrastructure and capabilities in all government organizations, the strengthening of service provision procedures through providing single service stations, and the launching of new communication channels. Furthermore, the creation of open data platforms will promote innovation and support entrepreneurship, which is expected to lead to the development of a large number of new applications and services.

In the early years of iGA's establishment, the aim was to introduce as many services as possible and over multiple platforms and channels; currently, more than 400 services are implemented. However, iGA soon realized that it would not be possible to maintain its international rank with this approach. In addition,

there was a limitation on the consumers of these services who could absorb the provided services on a supply basis rather a demand basis, i.e. services iGA believes are important and useful (supply) as against the services that are actually needed by the consumers (demand). This led iGA to review its strategy and to start measuring the effectiveness of the implemented services on one hand and to listen to feedback from consumers on the services introduced, their real needs and their priorities. To achieve this, iGA used various measuring tools, one of which was an annual customer satisfaction survey using an independent third party, as described in this paper.

2.2. Customer Satisfaction and Customer Satisfaction Index

The related literature reveals several perspectives on defining customer satisfaction. Some have described it in terms of a person's feelings of pleasure or disappointment (Oliver, 1980) that result from comparing a product's perceived performance (or outcome) with their expectations (Mandal, 2016). Others have viewed it as a reaction and evaluation of product performance or quality, given a person's pre-purchase expectations (Tse and Wilton, 1988; Anderson and Sullivan, 1993). However, there is unanimity on the comparison of the prior and post expectation of the product or results. As stressed by Mandal (2016) in terms of measuring satisfaction, it is essential "to measure both expectations at the time of purchase and reactions at some time after purchase". Since customer satisfaction is considered to be an attitude, as claimed by Mandal (2016), it is essential to assess customers' expectations and their consequences. Thus, a more detailed look at this construct is required in order to measure customer satisfaction. The work of Cardozo (1964), Olshavsky and Miller (1972) and Anderson (1973) on customer expectations (disconfirmed expectancy) and their influence on product performance evaluation has laid the foundation for many of the later researchers in this area (Churchill and Surprenant, 1982). Concepts such as expectations (manipulated and perceived), performance (manipulated and perceived), disconfirmation and satisfaction were studied, and the relationships and linkages among them were assumed. Since then, substantial research has been directed towards studying the antecedents and consequences of customer satisfaction, in order to further develop it as a well-defined and validly measured construct.

The multi-attribute model of customer satisfaction is one of the resultant approaches; this views the overall customer satisfaction as a function of the combined satisfaction at the attribute level. According to Anderson *et al.* (2000), this function can take three forms: symmetric, negatively asymmetric or positively asymmetric.

Determination of the attributes for measuring customer satisfaction may be complicated, depending on various contextual factors. Due to these differences, measures are unsuitable for comparison (i.e. comparing satisfaction across firms, industries, regions or countries). Thus, many attempts to propose an international unified and comparable Customer Satisfaction Index (CSI) have been made. Some organizations have established their own CSIs, such as Best Buy CSI, PChome Online e-CSI and New York City Government CSI. Other advanced standards have developed cause-and-effect-based models, such as the American Customer Satisfaction Index (ACSI), Customer Satisfaction Index for Singapore (CSISG), Hong Kong Customer Satisfaction Index (HKCSI) and Swedish Customer Satisfaction Index (SCSI).

The SCSI was the first national customer satisfaction index, and was created in 1989 by a team led by Fornell and Calleros *et al.*, (2012). This model included the five latent variables of customer expectation, perceived value, customer satisfaction, customer complaints and customer loyalty. Following this, many

countries such as the United States, Germany, and New Zealand followed the SCSi in creating their own customer satisfaction indices (Grigaliunaite and Pileliene, 2014). Of these, the American Customer Satisfaction Index (ACSI) is the most widely adopted standard (Awwad, 2012); it has been used by hundreds of companies and federal government agencies in the United States to measure the satisfaction of consumers with various goods and services (Angelova and Zekiri, 2011).

The ACSI model identifies key drivers of satisfaction and quantifies their relationships with overall customer satisfaction. ACSI consists of customer expectation, perceived quality, customer satisfaction, citizen trust and customer complaints (Yuan-Yuan *et al.*, 2007). Based on the ACSI, many countries have developed their own CSI, such as Korea, New Zealand, Indonesia, Taiwan, Barbados, Austria, Jordan (Awwad, 2012) and Malaysia (Maleki and Darabi, 2010).

The European Consumer Satisfaction Index (ECSI) is another index which was launched in 1999. ACSI and ECSI are the two most widespread and frequently used indices (Grigaliunaite and Pileliene, 2014). The ECSI is an economic indicator designed to assess customer satisfaction (Tellier *et al.*, 2000). It is an advanced version of the SCSi (Fornell, 2005) and shares many constructs with ACSI. It consists of customer expectations, perceived quality, perceived value, image, customer satisfaction, customer loyalty and customer complaints (Grigaliunaite and Pileliene, 2014).

3. RESEARCH MODEL AND HYPOTHESES

The current study applies a new way of measuring CSI, adopting a systematic model based on a well-recognized international standard CSI model. Hence, an initial review was conducted of the existing international studies on CSI. As mentioned in Section 2.2, studies have shown that in order to measure the CSI, it must be embedded in a system of cause and effect relationships, making the CSI the central piece in a chain of relationships. These relationships running from the antecedents of CSI – customer expectation, perceived quality and perceived value to the consequences – complains and loyalty. Most of the more well-known CSI standards are based on causality relationships, such as the ACSI, CSISG, HKCSI and SCSi. It can be observed that each model uses different manifest variables depending on the local context of the e-services, the type of e-services provided and whether they are targeting public or private sectors.

The BHCSI model was developed taking into account the nature of the iGA, the context of the Kingdom of Bahrain and the different types of e-services provided for different stakeholders, as illustrated in Figure (1). As shown in the figure, the model comprises ten dimensions, including the causal factors that affect customer satisfaction, i.e. customer expectation and perceived quality; the latter is determined by four factors, which are usability, information quality, security and responsiveness. Other factors in the model reflect the effects of customer satisfaction that include customer complaints, government image and trust (Figure 1).

3.1. The Causal Side of BHCSI

Usability is defined as “the degree to which a user can complete tasks effectively and efficiently “(Al-Momani, *et al.* 2010). It is related to appearance, ease of use and navigation, and the image conveyed to the users (Ojasalo, 2010). Many authors include usability as a necessary dimension to ensure the quality of e-services, such as Webqual (Barnes and Vidgen, 2002), eQual (Barnes and Vidgen, 2006) and QES (Fassnacht

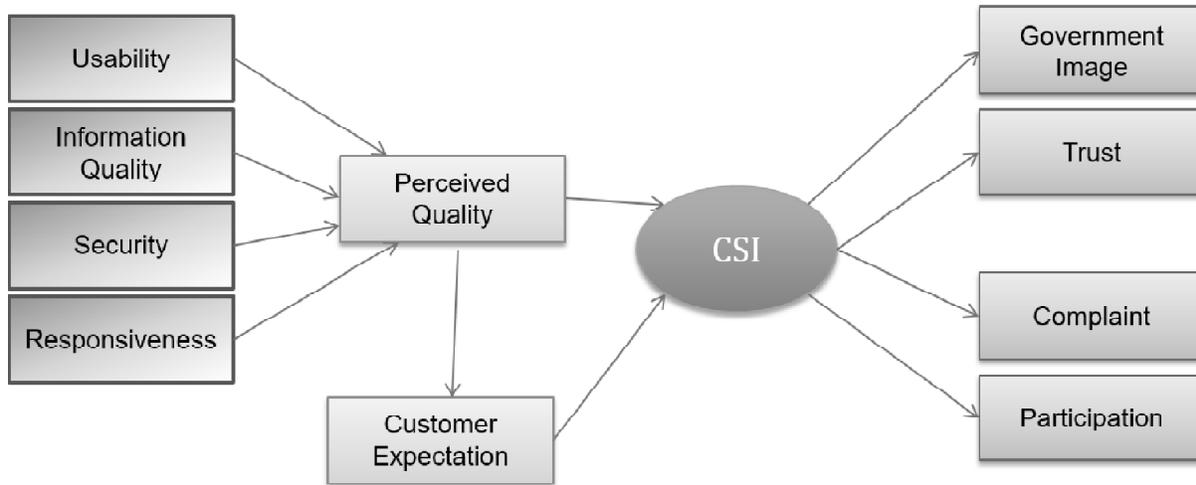


Figure 1: Research Model (BHCSI)

and Koese, 2006). Usability is one of the dimensions that show the strongest influence on overall perceived service quality (Jeon, 2009). The following hypothesis was therefore formulated:

H1: Usability has a positive effect on the perceived quality of the e-services provided by e-government.

Information quality refers to the quality of the outputs produced by the information system (DeLone and McLean, 1992). Thus, it refers to customers' evaluation of the information, characterized by precision, informativeness, relevance and availability (Cao *et al.*, 2005; Kim and Niehm, 2009). In addition, Huh *et al.* (1990) define four dimensions of information quality: accuracy, completeness, consistency, and currency. In the WebQual model, information quality is considered to be a factor of web service quality. Furthermore, Zeithaml *et al.* (2005) included information quality in their E-S-QUA model as a main factor for e-service quality. Hien (2014) also pointed out that perceived information quality positively influences perceived e-government service quality. Accordingly, we state the following hypothesis:

H2: Information quality has a positive effect on the perceived quality of the e-services provided by iGA.

Security refers to the freedom from danger, risks or doubts during the service process. Zeithaml *et al.* (2002) emphasized that security is one of the key attributes of the dimensions of website service quality. Many other researchers have presented security among the dimensions of online service quality (Madu and Madu, 2002; Wolfenbarger and Gilly, 2003; Yoo and Donthu, 2001). Thus, when online users are more satisfied with the security protection they will be more satisfied with the overall service quality (Mekovec and Hutinski, 2012). Askari *et al.* (2016) emphasized that service providers should focus particularly on three dimensions; security is one of the dimensions which are more related to a customer's perception of e-service quality, increasing satisfaction. Thus, the following hypothesis can be stated:

H3: Security has a positive effect on the perceived quality of the e-services provided by iGA

Parasuraman *et al.* (1985) defined responsiveness as the "readiness to provide quick service and assist and support customers and provide quick service." Many researchers have listed responsiveness among the dimensions of online service quality (Zeithaml *et al.*, 2002; Madu and Madu, 2002; Tahira *et al.*, 2012; Taylor *et al.*, 2014). Mengi (2009) also found that responsiveness was positively related to service quality

and customer satisfaction. It is also a parameter in WebQUAL, SITEQUAL, SERVQUAL, E-SQUAL and E-RecS-QUAL, and thus responsiveness is essential in measuring service quality (Tahira *et al.*, 2012; Taylor *et al.*, 2014). Therefore, the following hypothesis can be stated:

H4: Responsiveness has a positive effect on the perceived quality of the e-services provided by iGA.

Zeithaml (1987) defined perceived quality as citizens' judgments on the excellence or superiority of an entity based on their experience with services (Loughlin and Coenders, 2002). Perceived quality has a positive effect on citizen satisfaction (Kunstelj, Jukic and Vintar, 2010) which was evident in ACSI, SCSB, ECSI and MCSI. Caruana (2002) has also suggested a direct effect of perceived quality on consumer satisfaction, which is consistent with the findings of Jamali (2007) and Iglesias and Guillén (2004). Thus, the higher the perceived quality of a product, the higher the consumer satisfaction will be. Accordingly, the following hypothesis is proposed:

H5: Perceived Quality has a positive effect on the CSI of e-services provided by iGA

An expectation refers to the level of e-government service quality that citizens expect to receive before they use the services (Di Nisio and Di Battista, 2010; Yao and Zhao, 2010). According to Fornell *et al.* (1996), Customer Expectation is a determinant of overall customer satisfaction. Thus, citizens' confidence in their expectations with regard to a service will have much impact on satisfaction (Spreng and Page, 2001). Lewis and Booms (1983) stressed that Service quality is a measure of how well the service level delivered matches customer expectations which implies that there is a direct relationship between them specially that Gronroos (1992) defined service quality as a difference between customer expectations of 'what they want' and their perceptions of 'what they get'. Nasser, Salleh and Gelaidan (2012) in their research found that there was a significant correlation between customer expectation and perceived quality so accordingly the following hypotheses were proposed:

H6: Perceived quality has a positive effect on customer expectation.

Customers' expectations are also expected to have a direct and positive relationship with customer satisfaction (Anderson and Fornell Lehmann, 1994; Anderson and Fornell, 2000).

H7: Customer expectation has a positive effect on the CSI of the e-services provided by iGA.

3.2. The Effect Side of BHCSI

Image reflects the levels of the overall impression of the company that can be expressed in terms of two items: (1) word-of-mouth reputation; and (2) responsibility toward the parties concerned. Experiments in Denmark have also proved that image affects satisfaction (Martensen *et al.*, 2000). Gronholdt, Martensen and Kristensen (2000) indicated that image is an important component of customer satisfaction; it is expected that image has a positive effect on customer satisfaction (Andreassen and Lindstad, 1998). Accordingly, the following hypothesis is stated.

H8: CSI has a positive effect on the image of the government.

Morgan and Hunt (2009) defined trust as an expectation or willingness to believe that an organization can be relied upon to do what it has promised. Garbarino and Johnson (1999) emphasized that satisfaction plays an important role in public trust. This also supports the results of research by Nur Hayati (2011) who

found that satisfaction has an effect on trust. Thus, public satisfaction results in a fostering of public trust (Kim, Ferrin and Rao, 2009).

H9: CSI has a positive effect on trust in the e-services provided by the iGA.

A customer complaint is a disagreement between an organization and its customers (Fornell *et al.*, 1996); with technology, trust can be defined as the expectation that an individual or group will adopt a particular technology and rely on it (Bélanger and Carter, 2008). It is expected that an increase in customer satisfaction should decrease the incidence of complaints (American Society for Quality, 1998; Fornell *et al.*, 1996). Furthermore, Hirschman argued in his exit voice theory that the immediate consequences of increased customer satisfaction are lower numbers of customer complaints (Hirschman, 1970). Thus, the more satisfied the customers are, the less likely they are to complain. Accordingly, the following hypothesis is postulated.

H10: CSI has a positive effect on complaints about the e-services provided by iGA government.

Yao and Zhao (2010) built a user satisfaction model with six dimensions; among these factors is citizen participation, which refers to an initiative to encourage citizens to participate in online services. Ennew and Binks (1999) stressed that customer participation is positively related to service quality and satisfaction. Thus, it has been found that that participating customers are more satisfied than non-participating customers (Bendapudi and Leone, 2003). Accordingly, the following hypothesis is proposed:

H11: CSI has a positive effect on participation in e-government.

4. RESEARCH METHOD AND DATA COLLECTION

To achieve the research objectives, a quantitative approach was applied. A self-administration questionnaire was used to determine the customer satisfaction index of the e-services provided by the iGA using the developed BHCSI model. The population of the current study included three types of stakeholders for iGA: residents (G2C), business (G2B) and government (G2G). Each stakeholder has a different nature and characteristics, and different approaches were therefore used to identify the sample size of each population. Thus, cluster sampling was adopted (to cover the main four governorates in Kingdom of Bahrain) followed by a probabilistic random sampling method approach to select the sample size of residents as 2400. However, for government and business, a probabilistic stratified sampling method was followed in which the business and government population was divided into smaller business sectors and government entities. Then, a representative sample size was calculated using the sampling size equation from each sector to represent the sector. The sample sizes for each stakeholder were identified as follows.

Table 1
Sample size

<i>Residents</i>	<i>Business</i>	<i>Government</i>
2400	240	229

Table 2 shows the number of legible, correct and completed questionnaires that were returned from each stakeholder; these had different (although high) response rates, especially for business and government (89.2%, 96% and 85% respectively).

The surveyed age groups reflect a fair representation of Bahrain’s population. The results show that the age of most of the respondents was between 26 and 45 years old (56.6%, 75.2% and 80.9%). However, for the residents, there were a fair number of individuals aged between 18 and 25 (35.5%); this age group represents a very low percentage (7.7%) of the government sector and are missing from the business sector, as shown in Table 3. Table 4 demonstrates the distribution of respondents by educational level. The results reveal that most of the participants hold secondary or Bachelor’s degrees (7.6%, 80.4%, 70.6%), while those with intermediary schooling or less and PhD holders represent the smallest percentage. The results reflect the social makeup of the Kingdom of Bahrain as the percentage of educated people represents the highest segment.

Table 4
Sample of the demographics of the participants (education, occupation and nationality)

	<i>Residents</i>	<i>Business</i>	<i>Government</i>
Education			
Intermediary or less	13.10%	2.70%	4.10%
Secondary	40.80%	16.10%	11.30%
Bachelor	36.80%	64.30%	59.30%
Master	7.00%	13.40%	16.00%
PhD	1.00%	3.60%	6.70%
Occupation			
Self employed	6.90%	25.00%	1.00%
Employed	50.90%	73.20%	95.90%
Student	29.20%	0.00%	1.5%
Housewife	7.30%	0.00%	0%
Unemployed	4.20%	0.00%	0%
Nationality			
Bahraini	48.30%	51.80%	75.30%
Other Arab	16.10%	21.40%	10.30%
Asian	32.90%	23.30%	11.30%
Western	1.80%	3.60%	50.00%

The results in Table 4 also show that employed individuals represent the highest percentage of all the sectors (50.9%, 73.2% and 95.9%), with a mean of 73.3% for all three stakeholders. The results also show that the sample fairly represented the Bahraini population, which consists mostly of Bahrainis, followed by Asians, and Arabs, with averages of 57.8%, 2.5% and 15.9% respectively. However, the sample contains only 2% of Western respondents, who form a minority in the Kingdom of Bahrain.

5.2. Current Situation: Awareness, Usage of and Satisfaction with E-Services

The following section describes the results of the current situation regarding iGA services in tem of the interaction with government entities, the awareness and usage of, and the customer satisfaction with, e-services. Interaction with various government entities was investigated to establish the need for using

various government services and to understand the general interactions among the three stakeholders regarding these government entities. Table 5 presents a data analysis of the three stakeholders' interactions with government entities. The results show that there is a high level of interaction with the government entities among the three stakeholders, with an average of 88.1%. This indicates that there is strong physical interaction with the government entities, which may indicate a high need for government services.

Table 5
The current situation of e-government services

	<i>Overall</i>		
	<i>Residents</i>	<i>Business</i>	<i>Government</i>
Interaction	84.40%	88.70%	91.20%
Awareness	86.10%	90.00%	91.00%

To measure the awareness of e-government services, various components of awareness need to be explored. Thus, awareness needs to be measured on the level of e-government channels (national portal, mobile apps, e-kiosk, and National Call Centre, NCC), media used for the awareness, mobile apps and e-services. However, e-government services were implicitly measured through the awareness of e-government channels. The results show that the overall awareness of the three stakeholders was 89.1%, as shown in Table 5. These percentages represent a high level of awareness among residents, business and government (86.1%, 88.7%, and 91.2% respectively).

Table 6
Relationship between interaction and awareness

	<i>Not aware</i>	<i>Aware</i>
Not interact	6%	9%
Interact	6%	80%

To explore the relationship between interactions (physical/manual services) and awareness of the e-services, these were examined using a descriptive and correlation analysis method. Table 6 illustrates the relationships between interactions with government entities and awareness of e-government services. The results show that where there is no interaction, awareness is very low (9%); however awareness becomes very high when there is interaction with the government entities (80%). This is confirmed by the correlation test which shows a significant relationship ($R = 0.358$).

Table 7
Awareness, usage and satisfaction

	<i>National portal</i>	<i>Mobile Apps</i>	<i>e-Kiosk</i>	<i>NCC</i>
Awareness	74.00%	30.00%	42.00%	54.00%
Usage	70.00%	69.00%	46.00%	64.00%
Satisfaction	65.00%	54.00%	60.00%	56.00%

To measure the usage of the e-government services, various components of usage were explored. The usage of e-government channels and of the different e-services categories of the national portal and mobile apps were identified. The overall usage of the three stakeholders was measured, as shown in Table 7. The results demonstrate that the overall usage is 62.0%, with the highest usage for the national portal and mobile apps (70.0% and 69.0%) and the lowest usage for e-kiosk (46.0%).

Customer satisfaction was measured descriptively rather than adopting any particular model, as this would provide a score rather than an index. Customer satisfaction was measured at the level of e-government channels and e-government top services across the three stakeholders. This type of information can help the e-government authority to improve their services and enhance their channels. Customer satisfaction has been defined in various different ways, as discussed above. Customer satisfaction has been defined as the outcome or response to an evaluation process or post-users' evaluation of product or services (Kruger, 2016; Oh, 2000). Therefore, experience is a main factor in measuring satisfaction. Customer satisfaction is also related to the specific features and characteristics of the services (Llieska, 2013) as well as customer expectations of the services (Kruger, 2016). Therefore, the measurement of the customer satisfaction took into account all the above mentioned factors in such a way as to reflect the nature of the channels. For the digital channels such as the national portal, mobile apps and e-kiosk, the measurement covered availability, accessibility, safety and security of the interface, appearance, range of services offered, comprehension of usage guidelines, time taken to execute services, accuracy of information, organization and readability and expectation. However, satisfaction regarding the NCC was measured in terms of staff adequacy, willingness to listen to issues, timeliness when providing information, subject knowledge, quality of information, consistency of responses, solution(s)/guidance provided, parking spaces, cleanliness, ambience, waiting area, facilities for the disabled and public amenities. The results in Table 7 show that the national portal achieved the highest satisfaction percentage (65%), followed by the e-kiosk (60%), while mobile apps achieved the lowest level of satisfaction (54%). When measuring the satisfaction with these channels, it is useful to identify to what extent this reflects the awareness and usage of the e-government channels. Table 7 shows that the national portal achieved the highest percentage in terms of satisfaction, which reflects the fact that it has the highest awareness and usage. However, NCC and mobile apps have moderate satisfaction percentages, reflecting the low level of awareness. However, e-kiosk showed higher levels of satisfaction with a lower awareness and usage than other channels. Therefore, it cannot be concluded that awareness and usage are the main factors affecting satisfaction; there are other factors which need to be investigated.

5.3. Research Model Assessment

Establishment of the model begins with a PLS algorithm analysis, to test the validity of the construct's indicators and reliability. The reliability of the measured variables was tested by assessing the consistency of the variables using Cronbach's α . A Cronbach's α of 0.6 or higher is generally considered an acceptable level of reliability.

Moreover, construct reliability was measured using composite reliability and average variance extracted (AVE). The results are shown in Table 8. According to Table 8, it can be concluded that all constructs were reliable, since the score of the composite reliability is above 0.60, and similarly for the score of AVE, which was above 0.50.

Table 8
Goodness-of-fit index of latent variables

<i>Latent variables</i>	<i>Composite Reliability</i>	<i>Cronbach's Alpha</i>	<i>AVE</i>
USB	0.829	0.741	0.5
IQ	0.939	0.918	0.755
SEC	0.886	0.847	0.571
RSP	0.881	0.832	0.661
PQ	0.907	0.873	0.667
EXP	0.890	0.811	0.731
CSI	0.878	0.816	0.643
IMG	0.763	0.833	0.621
TRS	0.786	0.792	0.576
CMP	0.862	0.863	0.671
PP	0.711	0.799	0.582

To test the factorial validity of the variables, a confirmatory factor analysis (loading value) was performed. According to Tables 9 and 10, it can be observed that all loading factors have a score of above 0.50. Thus it can be concluded that the constructs have good convergent validity. It can be inferred that the research questionnaire has valid indicators for measuring the constructs in the model.

Table 9
Factor loading of the items

<i>Construct</i>	<i>Items</i>	<i>Factor Loading</i>
Usability	USB1	0.806
	USB2	0.804
	USB3	0.788
Information Quality	IQ1	0.849
	IQ2	0.843
	IQ3	0.761
Security	SEC1	0.849
	SEC2	0.861
	SEC3	0.809
Perceived Quality	PQ1	0.821
	PQ2	0.852
	PQ3	0.761
Expectation	EXP1	0.742
	EXP2	0.863
	EXP3	0.833
Customer satisfaction	CSI1	0.761
	CSI2	0.797
	CSI3	0.782
	CSI4	0.763
	CSI5	0.821

Table 10
Factors loading of items (continue)

<i>Construct</i>	<i>Items</i>	<i>Factor Loading</i>
Image	IMG1	0.83
	IMG2	0.734
	IMG3	0.689
	IMG4	0.762
	IMG5	0.823
Trust	TRS1	0.782
	TRS2	0.812
	TRS3	0.761
Complaint	CMP1	0.712
	CMP2	0.873
	CMP3	.854
Participation	PP1	0.762
	PP2	0.754
	PP3	0.862

5.4. Hypotheses Testing

To test both the BHCSI model for e-government services proposed in this study and the related hypotheses, structural equation modelling was performed using the bootstrapping method provided in PLS-Graph 3.0. The causal relationships in the proposed research model were tested. Consistent with Chin (1998), bootstrapping was applied to produce standard error and t-statistics. Bootstrapping is an inferential technique that generates t-values to assess the significance of a model's standardized path coefficients and, at the same time, conducts a re-sampling procedure to assess the significance of PLS parameter estimates (path coefficients) (Chin, 1998). The statistical objective of PLS is to show a high path coefficient R and significant t-statistics, thus rejecting the null hypothesis of no effect. The t-statistics need to be significant to support the hypothesized paths. R indicates the explanatory power of the latent endogenous variables.

The properties of the causal paths, including standardized path coefficients, t-statistics and an explanation of the variance for each equation in the hypothesized model are presented in Tables 11 and 12. The results reveal that all the identified factors have a significant impact on perceived quality. Thus, Usability, Information Quality, Security and Responsiveness are shown to influence the perceived quality ($r=0.126$, $T= 2.171$; $r=0.164$, $T= 2.102$; $r=0.209$, $T=3.713$; and $r=0.380$, $T=5.672$, respectively). Hence, H1, H2, H3 and H4 were accepted. Moreover, the results show that only 60% of the variance in the Perceived Quality is explained by Usability, Information Quality, Security and Responsiveness, and that most of the variance is explained by the Responsiveness, as shown in Table 12. On the other hand, the results reveal that Customer Satisfaction is impacted positively by Perceived Quality and customer expectation ($r=0.328$, $T= 5.771$; and $r=0.548$, $T= 16.931$). Perceived Quality, on the other hand, has a significant impact on customer expectation for the e-government services in the Kingdom of Bahrain ($r =0.757$, $T= 21.454$). Hence, H5, H6, and H7 were accepted. Moreover, the results show that 68% of the variance in Customer Satisfaction is explained

by Customer Expectation and Perceived Quality. However, 57% of the variance in Customer Expectation is explained by the Perceived Quality.

Table 11
Research Hypotheses

Research Hypotheses	Relationship	Path Coefficients R	T statistics (O/STERR)	P-value	Status
H1	Usability ———> Perceived Quality	0.126	2.091	0.037	Accepted
H2	Information Quality ———> Perceived Quality	0.164	2.872	0.004	Accepted
H3	Security ———> Perceived Quality	0.209	1.548	0.000	Accepted
H4	Responsiveness ———> Perceived Quality	0.380	2.762	0.006	Accepted
H5	Perceived Quality ———> Customer satisfaction	0.328	1.273	0.001	Accepted
H7	Expectation ———> Customer satisfaction	0.548	11.252	0.000	Accepted
H6	Perceived Quality ———> Customer Expectation	0.757	25.252	0.000	Accepted
H8	Customer satisfaction ———> Image	0.787	24.171	0.001	Accepted
H9	Customer satisfaction ———> Trust	0.445	14.102	0.006	Accepted
H11	Customer satisfaction ———> Complaint	0.694	21.613	0.004	Accepted
H12	Customer satisfaction ———> Public participation	0.656	23.672	0	Accepted

The results reveal that Customer Satisfaction shows a significant impact on Image, Trust, Complaints and Public Participation ($r = 0.767$, $T = 24.171$; $r = 0.445$, $T = 14.102$; $r = 0.694$, $T = 21.613$; and $r = 0.656$, $T = 23.672$, respectively). Hence, H8, H9, H10 and H11 were accepted. Moreover, the Customer Satisfaction explained more than 40% of the variance in Image, Trust, Complaints and Public Participation.

Table 12
Explanation of variances

Factor	R
% of the variance on perceived quality impacted of e-service usability, information quality, security and public responsiveness	60%
% of the variance on customer expectation impacted by perceived quality	68%
% of the variance on CSI impacted of perceived quality and customer expectation	57%
% of the variance on Image impacted of perceived quality and customer satisfaction	59%
% of the variance on Trust impacted of perceived quality and customer satisfaction	57%
% of the variance on Complaints impacted of perceived quality and customer satisfaction	48%
% of the variance on Public participation impacted of perceived quality and customer satisfaction	43%

5.4. Calculating the BHCSI

To calculate the BHCSI for e-government services, the formula proposed by Fornell *et al.* (1996) is used, as shown in Figure 2. In this equation, x_i is the average value of measurement item i , w_i is the weight of

$$CSI = \frac{\sum_{i=1}^n w_i \bar{x}_i - \sum_{i=1}^n w_i}{9 \sum_{i=1}^n w_i} \times 100.$$

Figure 2: CSI formula (from Fornell *et al.*, 1996)

measurement item i , and n is the number of measurement items. For the CSI for government e-services, $n=5$ since there are five measurement items.

The CSI has been calculated to measure the BHCSI, which represents the national customer satisfaction index. Thus, it represents the customer satisfaction index of the e-government services provided for residents, business and governments. In addition to the BHCSI, the CSI for the main stakeholders of the iGA (residents, business and government) has been calculated, as well as the CSI for each e-service

categories provided by the national portal, as shown in Figure 3. Figure 3 illustrates that the BHCSI is 79.4; this is very high and is above the international average of 75. Regarding the CSI of the stakeholders, the results show that both business and residents have a high CSI (80 and 79); however, government has the lowest CSI of 71.5, which is less than the international average. On the other hand, the CSI scores on the level of the e-services categories are varied and range between 50 and 90. The scores also vary for the different e-services categories, as shown in Figure 3.

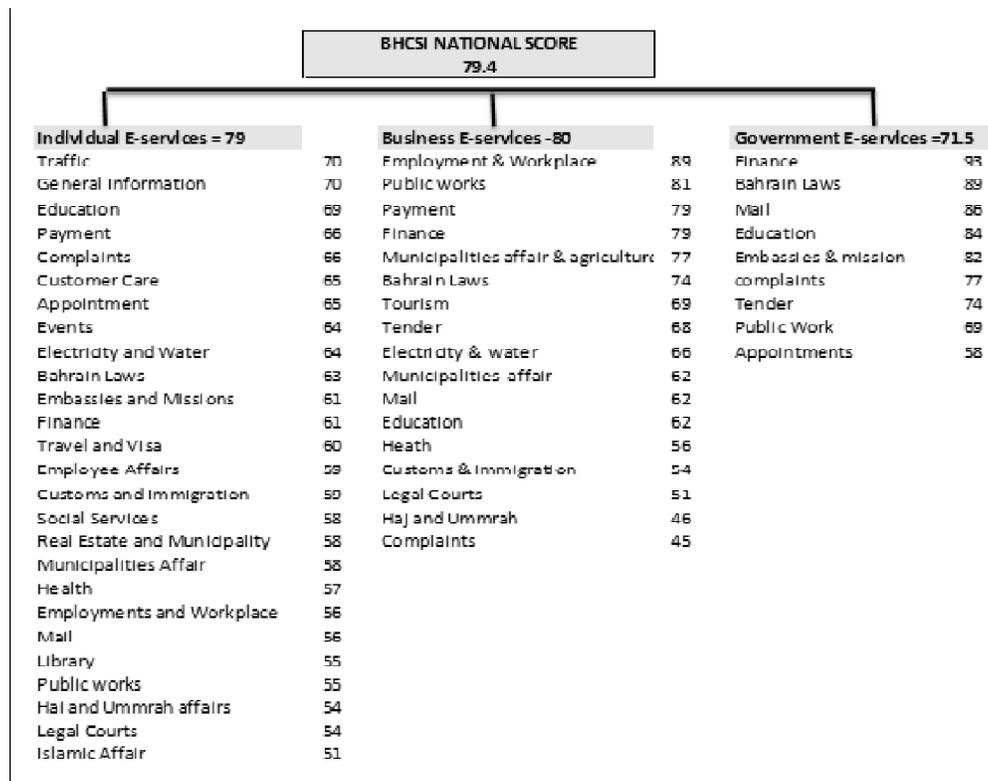


Figure 3: BHCSI

It should be mentioned that BHCSI does not account solely for a usage experience, but is also forward-looking, as it is embedded in cause and effect relationships. Moreover, BHCSI is a multi-item scale representing several aspects of customer attitudes: perceived quality, expectation, trust, complaints, participations and government image. Therefore, it is beneficial to explore the cause-effect relationship and the impact of the various aspects of customer attitude on the overall BHCSI. Thus, the BHCSI is explored from two sides: the factors causing and impacting the CSI, and the effects and impacts of the CSI. Table 13 demonstrates the results on the CSI of the cause side of the model; these reflect factors that have an indirect effect on CSI via perceived quality, in addition to the factors that have a direct effect on CSI such as perceived quality and customer expectation, as shown in the table.

Table 13
Indices of the cause-side of BHCSI

<i>Indirect cause (factors impacting the CSI indirectly via perceived quality)</i>			
<i>E-service usability</i>	<i>Information quality</i>	<i>Security</i>	<i>Public responsiveness</i>
79.9	83.3	82.6	78.6
<i>Direct cause (factors impacting CSI directly)</i>			
<i>Perceived quality</i>		<i>Customer expectation</i>	
80.9		78.8	

It can be noticed that the perceived quality has a score of 80.9, which can be considered very high. The perceived quality is impacted by four factors: usability of e-services, information quality, security and public responsiveness. The results in Table 13 indicate that the CSI scores for the usability of e-services, information quality and security are also high. However, although the public responsiveness index is above average, it is lower than the index of the other factors.

Customer expectation, on the other hand, has a lower index than the perceived quality, although this is still high (78.8).

Table 14
Indices for the effect side of BHCSI

<i>The effect of the CSI</i>			
<i>Government Image</i>	<i>Public Trust</i>	<i>Public Complaint</i>	<i>Public Participation</i>
82.7	79.2	76.5	79.7

Table 14 shows the results of the effect side of the BHCSI model. The results show that most of the identified impact factors for the CSI, such as government image, trust, complaints and public participation, have indices of above 76.5. Thus, CSI has very high impact on these factors, which is reflected by the index of the CSI.

6. DISCUSSION

In the current study, a customer satisfaction index model for e-government services (BHCSI) was proposed, and the index was calculated using the model developed here. In addition, the study provides general information on the current situation concerning the e-services provided by the iGA in terms of its awareness, usage, and satisfaction; these can be used to provide an indication of the BHCSI and other CSIs identified for the e-services of the iGA.

The overall customer satisfaction index of BHCSI for the e-services is 79.4; this can be considered very high, since it is above the average international CSI of 75. The BHCSI for the e-services in the Kingdom of Bahrain is comparable to the ACSI of the federal governmental websites of the USA (ACSI, 2017) and those of several online services across the world, such as the CSI of Singapore (CSISG, 2005) and the CSI of RFID services in Korea (Park *et al.*, 2008). Although the descriptive analysis of the customer satisfaction score (not the index) indicates a low satisfaction for the e-services channels (60%) as well for the e-services provided for the different stakeholders (64% , not shown in the current study), the iGA is doing well nationally and internationally based on the BHCSI. The descriptive approach to calculating the customer satisfaction can be used by the iGA when setting their KPIs for improving e-services and measuring their performance.

The study also measured the CSI of the stakeholders. The results revealed that the overall CSIs for individual e-services and business e-services are above average (79 and 80 respectively). However, the CSI for government e-services is below average (71.5). Thus, at sector level, the iGA is also doing very well regardless of the low achievement in the government sector. The study also measured the overall CSI of the e-service categories of the national portal. These contain a number of e-services provided by various government entities and offered to different stakeholders: individual, business and government. The results revealed that there is no special trend or pattern in the scores for the e-services categories, as shown in Figure 3. Thus, the results demonstrate that many of the e-services categories achieved very low scores independent of the targeted stakeholders, as shown in Table 15.

Table 15
E-services with low CSI scores

<i>E-services categories</i>	<i>Individual E-services</i>	<i>Business E-services</i>	<i>Government E-services</i>
Public works	55	81	69
Employment and workplace	56	89	-
Finance	61	79	93
Payment	66	79	-
Education	69	62	84

The results in Table 15 indicate that e-services categories such as legal, court and health scored very low for both residents and business. Conversely, the results in Table 16 show that some e-service categories achieved very high scores for certain stakeholder. However, the same e-service categories scored very low for other stakeholders, such as Finance and Employment and Workplace. The present structure of the e-

services categories in the national portal may be causing this contradiction in the scores for the e-services categories. The e-services categories reflect different e-services and governmental elements which target different stakeholders, as shown in Figure (3). This structure of the e-services makes benchmarking more complicated and ineffective. The government will then obtain different scores for each stakeholder, although these e-services are provided by a single entity. Different factors may impact the CSI of e-services categories, such as the importance and significance of the e-services provided to the stakeholder (renewing passports or issuing birth certificates) and the segments served by such e-services, such as youths, students and so on.

Table 16
CSI of e-services categories under different stakeholders

<i>E-services categories</i>	<i>For individual</i>	<i>For Business</i>
Legal Court	54	51
Customer immigration	59	54
Health	57	56
Haj and Ummara	54	46

In addition, it can be observed that the overall CSI a stakeholder does not reflect the e-services categories targeting them. For instance, the overall CSI of the stakeholder may have a high score, as for the individual e-services; however, many of the e-services for this stakeholder may have very low scores. Conversely, government has the lowest overall CSI; however, most of the e-services for this stakeholder have high CSI scores, as shown in Table 17. These results show that 55% of e-services categories for the government have a CSI of 80 or above, while individual e-services which scored very highly (79) have no e-service categories with a score of 80 or above, as the majority (42.3%) have an index of between 60 and 69 (Table (17)).

Therefore, there is a need to restructure the e-services categories in such a way as to provide a better method of measuring CSI. The e-services categories can be restructured to reflect the government entity provided, such as educational e-services (reflecting the Ministry of Education) with subcategories for individual, business and government. In this case, a single CSI score could be identified for the e-services categories and the authority or government providing these e-services, as shown in Figure 4. It would then be easier to assess and evaluate the CSI of each e-services category, as reflected by the index of the government providing it. The identified CSI will consequently be more effective and more comparable to what is being done internationally, and hence can be used to improve and develop better and more effective e-services.

Table 17
Range of CSI score for each stakeholders

<i>Score</i>	<i>Individual E-services</i>	<i>Business E-services</i>	<i>Government E-services</i>
80 and above	0%	11.8%	55.6%
Between 79 and 70	7.7%	23.5%	22.2%
Between 69 and 60	42.3%	35.3%	11.1%
Between 59 and 50	50%	17.6%	11.1%
Below 50	0%	11.8%	0%

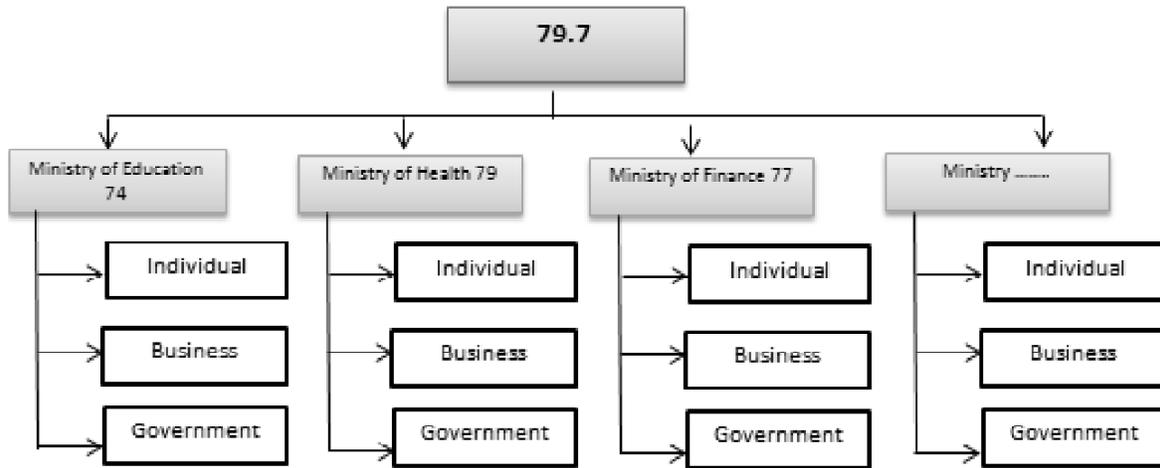


Figure 4: New structure proposed for e-services on the national portal

On the other hand, the cause and effect of the BHCSI can be explored from the results of the structured model analysis. The results reveal that more than 68% of the variance in the CSI is influenced by the usability of e-services, information quality, security and public responsiveness. However, most of this variance is caused by public responsiveness, which has a moderate impact on the perceived quality. This indicates that although the public responsiveness is a very important factor, customers still do not receive good responses from the e-services providers. The governments may not promote a good response, or they may be busy to respond to customer requests. The responsiveness variable in the current study was measured as an aggregated meaning of responsiveness, including willingness to help and government availability to respond to any requests. However, this measure did not consider the different variants of responsiveness that include dedicated, constrained, purposive, and entrepreneurial and negotiated responsiveness, based on Bryer's (2007) classification. Government employees, in particular, are concerned primarily about certain types of responsiveness that can satisfy their requirements, such as purposive responsiveness, which targets defined goals, or constrained responsiveness, which helps in identifying rules, norms and procedures (Bryer, 2007). Therefore, more emphasis should be placed on responsiveness, as it has very high impact on perceived quality (0.383). There is a need to address the other variants of responsiveness to customize the different stakeholder's needs.

In contrast, usability, information quality and security have a weak impact on the perceived quality of the e-services. Although security has a higher impact than usability and information quality, it is still low (0.209). There are many reasons for these findings. Firstly, other factors need to be examined in terms of their impact on the perceived quality of the e-services. Although previous studies have considered these factors and their impact on perceived quality (Billy *et al.*, 2008; Al-Manasra *et al.*, 2013), different dimensions for the e-services and web site quality have in fact been identified. The SERVQUAL measurement considers tangibles, reliability and assurance as the main dimensions for perceived quality (Ramseook-Munhurrun *et al.*, 2010). Other factors such as efficiency, fulfilment and system availability have been identified by Parasuraman, Zeithaml and Malhotra (2005) to be essential issues in measuring the e-service quality. Therefore, other factors need to be investigated for their impact on enhancing customer satisfaction before the iGA confirms the BHCSI as a national model for the Kingdom of Bahrain. The second reason for

these results relates to the items used to measure these factors. For instance, usability was measured from the structural design of the website (navigation, browsing and scrolling, and graphics and animation) while information quality was measured based on the currency, accuracy and sufficiency, and security was measured based on the adequacy of security, privacy and protection. Thus, other items may need to be considered in measuring usability, security and information quality. For example, usability is generally measured based on the ease of use (Bevan, 1995). Moreover, usability can have a direct impact on customer satisfaction rather than an indirect impact. Chang and Chen's (2008) study supports the argument that usability, in term of interface quality, has a positive influence on user satisfaction. Therefore, these factors need to be investigated to consider their direct impact on customer satisfaction. All the aforementioned considerations are factors that impact the perceived quality of the e-services and need to be considered by iGA to assure the provision of high quality e-services for their stakeholders.

On the other hand, the findings show that more than 60% of the variance in customer satisfaction is caused by perceived quality and customer expectation. Although O'Laughlin and Coender (2002) found that quality seems to be the only variable required to explain and predicate customer satisfaction, the current study found that both perceived quality and customer expectation are significant factors predicating and explaining customer satisfaction for e-services in the Kingdom of Bahrain. Malik (2011) and Hurley and Estelami (1998) argued that there is a causal relationship between service quality and customer satisfaction. Measuring perceived quality is a better way to determine whether the services are good or bad, and whether or not the customer is satisfied (Agbor, 2011). Moreover, the findings show that perceived quality has a strong relationship with customer expectation, which in turn has a strong impact on customer satisfaction. Thus, perceived quality impacts customer satisfaction directly or indirectly, via customer expectation. Customers will be more satisfied with the e-services provided if they perceive a high quality of service that meets their needs and expectation. It has been suggested that service quality should be measured based on the discrepancy between service expectation and the quality of the services or the performance (Nasser *et al.*, 2012; Al-Manasra *et al.*, 2013). Therefore, the customer or user can predict whether the quality of the services is equal or greater than the expected level (Al-Manasra *et al.*, 2013). The iGA and other governmental entities in Kingdom of Bahrain are facing increasing expectation and greater demands from their stakeholders (residents, business) regarding the public services provided. Hence, there is a need to place more emphasis on reaching customers' expectations, as this is critical for enhancing customer satisfaction.

The results on the effect side of BHCSI demonstrate that customer satisfaction is the main factor explaining and impacting government image, public complaints and public participation. Customer satisfaction in general explained between 40% and 70%, and the impact ranged from 0.765 to 0.827. Many studies have revealed that image influences customer satisfaction (Abd-El-Salam and Sawky, 2013) or that customer satisfaction moderates the relationship between image and customer loyalty (Andreani *et al.*, 2012). Nevertheless, the current study shows that customer satisfaction has an impact on government image. This finding is consistent with the majority of studies, which agree that image is the consequence of a procedure by which customer evaluates and distinguishes corporate products or services (Bravo *et al.*, 2009). It can be also perceived as the result of accumulative feeling, attitude, and experience with the organization (or the government services) which is kept in mind and transformed to a positive or negative meaning to reconstruct the image of the government (Bravo *et al.*, 2009). This corporate image consists of

two major components: practical and emotional (Kandampully *et al.*, 2007). Hence, customer satisfaction will impact the customer interaction, experience, and understanding regarding the government services as well as the tangible parts of such services (Lee *et al.*, 2011). However, achieving a high level of satisfaction can enhance government participation and trust. Participation and trust are essential to support a shift from government-centred services to citizen-centred services in which citizens and businesses determine their own needs and form partnerships with government (OECD, 2016).

7. CONCLUSION

In general, the current study shows that the iGA is making huge efforts to transform the Kingdom of Bahrain into a digital society and economy, as part of the development and implementation of a government strategy to achieve a digital transformation. The e-services provided by the iGA are accepted and used by individuals with various ages, gender, nationality and education. Even at the level of government and business, the usage of these e-services is high, and in some sectors they rely on these digital transactions. Thus, digital services are beginning to be substituted for the traditional physical services in the Kingdom of Bahrain. Governments in many countries are obliged by a number of imperatives to strengthen the digitization of their public services, consistent with the recommendations of the digital government strategies of OECD (2016), which provide guidance. Digitization plays a key role in leveraging the transformation of the public sector in general, given its potential to increase the productivity and inclusiveness of service production and delivery in public welfare areas (OECD, 2016).

The decision taken by the iGA to adopt BHCSI in order to identify a level of improvement for enhancing customer satisfaction and optimization for the strongest impact is the main achievement of the Kingdom of Bahrain towards building a digital society. Although many countries have adopted CSI models to measure their private online services, as discussed above, few have adopted their own CSI model and used the ACSI model to measure their online public services. BHCSI will benefit iGA in identifying the best ways to enhance economic growth and living standards towards building a digital society; at the same time, it will benefit stakeholders in having a voice in measuring those standards that reflect the economy and daily life.

Moreover, reaching a customer index of 79.4 is another achievement for this small country. Many countries have failed to reach this high score, and it is therefore an outstanding accomplishment and indication of success for the iGA and the Kingdom of Bahrain. The BHCSI can provide many opportunities for the iGA and the Kingdom of Bahrain in general. It is a multi-item scale, embedded in cause-and-effect relationships, and presents various aspects of customer attitudes. Thus, it does not only account for the usage experience, as it provides an advanced view. In this case, it can provide two types of evaluation: transaction-specific satisfaction and cumulative satisfaction (customers' overall experiences with the e-services). This can provide a baseline for determining whether the residents or business are becoming more or less satisfied with the e-services provided. Moreover, BHCSI can be benchmarked and compared with the international CSI to provide an indication of global customer satisfaction and achievement of e-services in the Kingdom of Bahrain. It can be also compared cross-sectionally within a given period. Hence, BHSCI can be used to determine how a particular e-service category or ministry is doing relative to the best results (e-service category). Tracking the overall BHSCI over a given period can yield interesting insights for improving national performance.

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