COBRA Framework to Evaluate E-Government Services: A Citizen-Centric Perspective

Abstract

E-government services involve many stakeholders who have different objectives that can have an impact on success. Among these stakeholders, citizens are the primary stakeholders of government activities. Accordingly, their satisfaction plays an important role in e-government success. Although several models have been proposed to assess the success of e-government services through measuring users' satisfaction levels, they fail to provide a comprehensive evaluation model. This study provides an insight and critical analysis of the extant literature to identify the most critical factors and their manifested variables for user satisfaction in the provision of e-government services. The various manifested variables are then grouped into a new quantitative analysis framework consisting of four main constructs: cost; benefit; risk and opportunity (COBRA) by analogy to the well-known SWOT qualitative analysis framework. The COBRA measurement scale is developed, tested, refined and validated on a sample group of e-government service users in Turkey. A structured equation model is used to establish relationships among the identified constructs, associated variables and users' satisfaction. The results confirm that COBRA framework is a useful approach for evaluating the success of e-government services from citizens' perspective and it can be generalised to other perspectives and measurement contexts.

Keywords: COBRA; E-government service; Users' satisfaction; Structured equation modeling; Scale development; Performance measurement.

1. INTRODUCTION

E-government services influence many stakeholders including citizens, government employees, information technology developers, and policy makers. Each stakeholder has different interests and objectives that may have an impact on the success and take-up of e-government services (Osman *et al.*, 2011). In the literature, there have been a large number of models and frameworks to evaluate e-government service success for different purposes or from different perspectives (Jaeger & Bertot, 2010). Although, these models aim to help policy makers and practitioners to evaluate and improve the provision of e-services, little effort has been made to develop a holistic model to evaluate e-government services and their interactions with users (Wang, Bretschneider & Gant, 2005). However, the success of e-government services is a complex concept, and its measurement should consider being multi-dimensional

factors (Wang & Liao, 2008; Irani, Elliman & Jackson, 2007; Irani, Love & Jones, 2008; Weerakkody & Dhillon, 2008). Therefore, in this study, a new conceptual model to measure e-service success from diverse stakeholders' perspectives is proposed.

The model development methodology follows a grounded theory approach in which an extensive literature review on existing e-service assessment models is conducted to identify the various fragmented success factors (or key performance indicators, KPIs). The identified KPIs are then classified into four main groups: *cost*; *benefit*; *risk*; and *opportunity*. Accordingly, users' satisfaction is measured in terms of the cost-benefit and risk-opportunity analysis for engaging with an e-service. This analysis has its roots in social science theories, and is in line with the recent e-service evaluation literature (Osman *et al.*, 2011; Millard, 2008). Thus, the objectives of this paper are threefold. Firstly, the paper develops a comprehensive model to evaluate users' satisfaction with e-government services; secondly, the paper develops tests, refines and validates a scale to evaluate users' satisfaction; and finally, it validates the relationships between constructs in the proposed model, associated manifest variables and users' satisfaction. By doing so, this research will open up new directions for future research in evaluating an e-government services.

In the following sections, we first present a theoretical background on the evaluation of e-service success and introduce a new conceptual model along with associated assessment components. Section 3 discusses the model scale development stages that include data collection and data analysis on a selected sample of e-government services in Turkey. The final section concludes with theoretical and managerial implications, limitations, and suggestions for further research directions.

2.   THEORETICAL BACKGROUND AND MODEL DEVELOPMENT

2.1.   Theoretical background

There have been numerous attempts by e-government researchers and practitioners alike to present comprehensive models to assess the success of e-government services from a user perspective. An investigation of the literature on conceptual models/frameworks to evaluate user satisfaction with e-government services reveals a number of studies [see for example Irani *et al.*, (2008); Jaeger & Bertot (2010); Rowley (2011); Verdegem & Verleye (2009); Carter & Weerakkody (2008); Venkatesh (2006)]. However, these models are adapted versions of Information Systems (IS) or e-commerce adoption models. In particular, *SERVQUAL* (Parasuraman, Zeithaml, & Berry 1988), the *National Customer Satisfaction Indices (NCSI)*, the *Information Systems (IS) success model* (DeLone & McLean, 1992, 2003) and the *Value Measurement Model (VMM)* serve as an outline for these models. Nonetheless, the e-government services evaluation process differs significantly from the traditional IS or e-commerce process (Osman *et al.*, 2011). Thus, the proposed existing models, as illustrated in Table 1, are insufficient for comprehensively assessing the multidimensional and multi-stakeholder influences that e-government services encapsulate. Furthermore, the limited scope of analysis (e-service quality, IS success constructs) and the resulting context-specificity significantly reduces the possibility of generalizability of these models in an e-government services context. Consequently, there is an urgent need to develop a model that systematically and psychometrically measures e-government service success from a user perspective, as the SERVQUAL, NCSI, and IS success models do for e-commerce. Academic researchers in different fields (IT, operations management, and public administration) have attempted to identify criteria to be used in evaluating e-services. On the basis of a synthesis of the extant literature, these criteria are reviewed as follows.

First, the SERVQUAL model was developed to measure e-service quality (Papadomichelaki & Mentzas, 2009). It consists of 22 service quality measures that are organised in five dimensions: *tangibles* (appearance of physical facilities, equipment, personnel and communication materials); *reliability* (ability to perform the promised service dependably and accurately); *responsiveness* (willingness to help customers and provide prompt service); *assurance* (knowledge and courtesy of employees and ability to convey trust and confidence); and *empathy* (provision of caring, individualised attention to customers). Based on this model, the quality of these dimensions is the main driver of user satisfaction. User satisfaction is defined as the difference between perceived quality and expected quality (Papadomichelaki & Mentzas, 2009). This model was expanded and updated by different researchers and new models were proposed to measure user satisfaction with e-services. For example: Parasuraman, Zeithaml & Malhotra (2005) proposed the E-SQUAL model; Balog *et al*. (2008) proposed e-ServEval; and Papadomichelaki & Mentzas (2009) proposed the e-GovQual model.

The Customer satisfaction index (CSI), on the other hand, was developed to assess customer satisfaction with the provision of private and public sector services. It consists of a set of causal relationships that link *user expectation, perception of quality* and *perceived value* as antecedents of *user satisfaction,* and *outcomes* and *user complaints* as consequences. Consequently, this model was developed to measure user satisfaction with government services (Fornell *et al*., 1996). Then, the outcomes component of the CSI model was modified to measure user satisfaction with the provision of e-government services (van Ryzin *et al.*, 2004; Kim, Im & Park, 2005). The outcome of user trust replaces the price-related outcomes found in the private sector model. Also, in the private sector, maintaining customer loyalty and reducing customer complaints is an important goal in maintaining profits, whereas the main goals of government services is to gain customer trust.

Third, Chen, 2010, Floropoulos *et al.*, 2010, and Jang, 2010, among others, adopted the IS success model to assess e-services success. In the IS success model, the *qualities* of *system*, *information*, and *service* serve as motivators to use the e–service that will ultimately affect user satisfaction. Information quality involves features such as accuracy, relevancy, precision, reliability, completeness, and currency; whereas system quality refers to ease of use, user friendliness, system flexibility, usefulness and reliability. Accordingly, the qualities of information, system, and service will affect the subsequent use of e-services. As a result of using the e-service, certain benefits will be achieved, which will positively or negatively influence user satisfaction and further use of the e-service.

Finally, the VMM model (U.S. Federal CIO Council, 2002) is a cost-benefit and risk analysis tool designed to capture the dimensions that are hard to quantify in a traditional financial return-on-investment study (Foley & Alfonso, 2009). It perceives e-service success as a trade-off between *value* (*benefit*) and *cost and risk*. Therefore, the assessment based on this model involves multidimensional analysis of values such as *direct user value*, *social/public value*, *government financial value*, *government operational/foundational value*, and *strategic/political value*. These values are quantitatively measured through a set of elements. Accordingly, it becomes possible to make a decision for each element. Hence, it is not only about attaining benefit or reducing cost; it is about doing both in an objective manner. Such a VMM model would allow comparison between different values (cost; risk; return) among e-services. Moreover, it would provide policy makers with qualitative data that would help in assessing the potential benefits of using e-government services. However, none of the VMM published studies considered monitoring and evaluating performance at an individual e-service level or across number of e-services. For a recent analysis of methodologies utilised in e-government research from a users' satisfaction perspective, we refer to Irani et al. (2012).

<<Insert Table 1>>

2.2.   Motivation to propose a new model

The ultimate objective of e-government is not only to obtain information, but also to encourage frequent and recurring use of the e-services by citizens (users). Thus, satisfying users' needs provides the service providers with a useful explanation about the re-use and the success of their e-government services. Efforts to find out the most significant factors affecting user satisfaction and the success of e-government services have been evolving many years since its inception as service delivery method in the public sector (Carter & Bellanger, 2005; Morgeson et al., 2011; Venkatesh, 2006; Rai, Lang & Welker, 2002). Yet, the *gap* between users (citizen) adoption and the efforts made by the service providers (government) to diffuse e-government services has been a concern for many governments. Therefore, 'knowhow' factors affecting user satisfaction and the development of a new model to measure e-government service success is necessary (Wang & Liao, 2008).

To discern how various factors affect user satisfaction, the available methods such as SERVQUAL and e-government satisfaction index models only account for the e-service quality that includes some benefit and risk, but ignores cost and opportunity aspects. Whereas, the IS success model accounts for user benefits and part of opportunity aspects but overlooks cost and risk. Hence, these models, among others, do not capture the full spirit of user satisfaction. Therefore, there is a need to rectify the shortcomings of those models and propose a holistic assessment framework for e-government services evaluation based simultaneously on benefits, costs, and risks to users of using e-government services.

2.3.   The proposed model

To develop a new evaluation model that measures user satisfaction with e-government services, proposed KPIs in the extant literature are analysed to understand how they affect user satisfaction. Based on this analysis, the observed performance indicators are grouped into four sets of constructs: Cost, Benefit, Risk, and Opportunity. The cost and benefit variables are

mostly tangible and are often easy to measure, whereas risk and opportunities are mostly intangible. The expected directions of the hypothesised causal-effect relationships among the four constructs of the new framework called COBRA: **C**osts, **O**pportunities, **B**enefits, **R**isks **A**nalysis are presented in Figure 1.
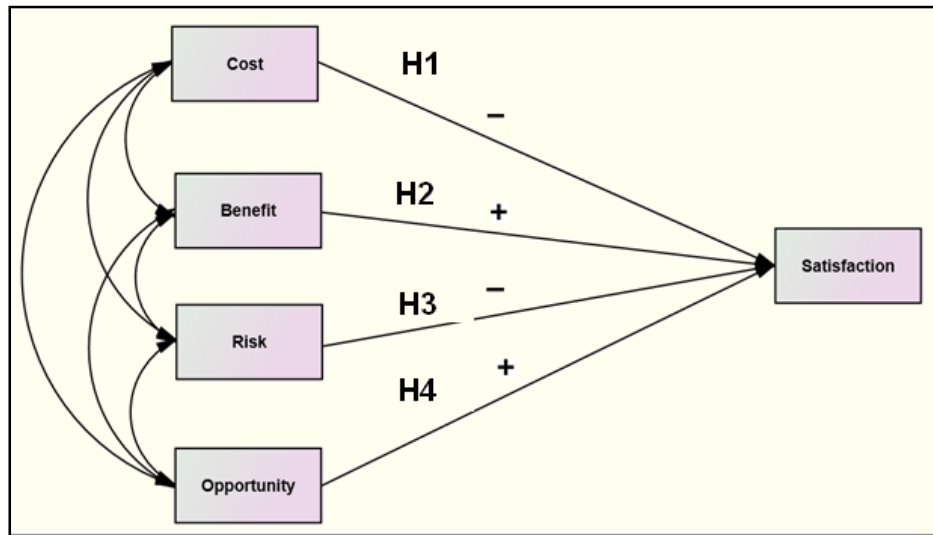
Figure 1: The COBRA model for user satisfaction

Figure 1 shows the relationships between the model constructs. The expected relationships between user satisfaction with both benefit and opportunity constructs are positive, whereas it is negative with both cost and risk constructs. Also, based on theoretical causal-effect relationships between the cost-benefit analysis and the risk-opportunity analysis with user satisfaction, it is expected to have some relationships between these constructs. These proposed relationships between model constructs have their roots in social science theories such as: *social exchange theory (SET)*, *expectation-confirmation theory (ECT)* and strategic management theories such as *SWOT analysis theory*. Given these relationships, user satisfaction can be achieved through a balancing of users' cost and risk with benefit and opportunity. Thus, e-government service success is largely shaped by the extent to which the government can provide such balance. It can be seen that the COBRA framework can provide a strategic quantitative measurement analysis that complements the strategic qualitative approach of SWOT strategic management analysis. Short term cost-benefit economic and

financial values and can be integrated with long term risk and opportunity societal and impactful values to provide a thorough analysis to measure public and private organization shared values beyond classical measurement approaches. For more details on COBRA issues related to E-Government Implementation, we refer to the comprehensive review in Weerakkody et al (2013).

2.3.1. *Social Exchange Theory (SET)*

SET was proposed by Blau (1964) to explain social relationships (exchange) using economic concepts such as cost and value (benefit). According to the theory, people invest in their social interaction, if and only if their input (cost) into such an interaction is less than the value (benefit) they may get out of it. The greater the value is, the more a person is satisfied and thus invests more in an individual relationship. Fundamentally, within the e-service context, SET explains the role of: cost, benefit, risk and opportunity in a user satisfaction formulation. Consequently, the cost and risk would represent the user's inputs when using an e-service interaction, whereas the benefit and opportunity would represent the value of such interaction. By analogy, if the benefit and opportunity values are greater than the cost and risk values, then an e-service user would be more satisfied and more likely to continue using such e-service; otherwise the user will not re-use.

2.3.2. *Expectation-Confirmation Theory (ECT)*

ECT was proposed by Oliver (1980) to study consumer satisfaction, repurchase intention and behaviour. Based on this theory, consumers compare their initial expectation prior to purchase with the actual performance after a period of initial consumption. Accordingly, the consumers are satisfied if their initial expectation matches the actual perceived performance. In an e-service context, users have an initial expectation about cost, benefit, risk and opportunity, and if they find evidence that the actual e-service fulfils their expectation, then users' satisfaction level will be high and they will probably re-use the service.

8

2.3.3.   SWOT theory

Finally, SWOT analysis was introduced in the early 50's as a strategic planning tool to evaluate any company, service or product compared to their competitors, other services or products, (Jackson, Joshi, & Erhardt, 2003). This theory considers both internal and external factors that may have an impact on company decisions. Simultaneously, companies need to assess their internal environment (*Strengths* and *Weaknesses)* with their external environment (*Opportunities* and *Threats)* to identify and exploit new opportunities before their competitors. In our analogy, e-service strengths correspond to benefits, weaknesses to costs, threats to risks and opportunities are the same. Normally, the costs and benefits are internal factors to the e-service, whereas the opportunities and risks are external factors. Users tend to use e-services if the obtained benefits and opportunities from using online service are higher than those from traditional government services.

2.4.   Model Constructs

2.4.1.   Cost

Although cost, in terms of money and time, is reported as one of the most important factors in the use of e-services (Medeni *et al*., 2011), there are only few previous studies in the extant literature that directly investigate the impact of cost on user satisfaction. For example, Whitson & Davis (2001) defined e-government as: "*. . . implementing cost-effective models for citizens, industry, federal employees, and other stakeholders to conduct business transactions online*". This means that engaging users in an e-service suggests providing it at high quality and low cost. Thus, e-services will result in significant cost savings to governments and citizens alike (Kumar *et al.*, 2007).

E-commerce literature, on the other hand, recognised the importance of the construct; hence operational efficiency is defined in terms of the costs and time savings of using online service (Ancarani, 2005; Verdegem & Hauttekeete, 2007). Similarly, perceived usefulness is defined

by the extent to which the user believes that extracting online information will save his/her time (Kumar *et al.*, 2007); and reduce cost (Shih, 2004). Furthermore, in e-commerce literature, it is argued that users compare the value provided by the online service with the costs of searching, ordering, and receiving products and services (Keeney, 1999).

To the best of our knowledge, this is the first study that has focused solely on the impact of cost on user satisfaction. Cost, which is often tangible, is measured through two sub-constructs: *money* and *time* costs. Monetary cost includes authorisation cost for authentication and online registration with the (web) site cost, whereas time cost involves access time (number of attempts to find the requested service on the site) and post-interaction time (time to receive confirmation of submission or waiting time to receive the requested service).

2.4.2.   *Benefit*

There is a growing agreement of the need to address the notion of "*benefit to the user*" in any e-government service evaluation (Irani *et al*., 2005). One of the challenges in such evaluations is in having a proper evaluation of tangible and intangible benefits (Gupta & Jana, 2003) and in identifying and quantifying such benefits (Alshawi & Alalwany, 2009). Also, it is difficult to determine the precise benefits associated with e-government (Beynon-Davies, 2005). Therefore, there is a need to develop success measures that accurately capture user benefits.

Few attempts, in an e-government and e-commerce context, have been made to address user benefits; Scott, DeLone & Golden (2009) suggested a set of factors that range from efficiency gains such as faster response times, to improvement in services such as greater control of the service. Shareef *et al*. (2011) identified more e-service benefits such as: effectiveness; efficiency; availability; accessibility from anywhere; comfort in use; time savings; cost savings and convenience. Conversely, Gilbert, Balestrini, & Littleboy (2004) proposed a different set of benefits including: avoidance of personal interaction; control over the delivery of the e-

service; convenience; saved money; personalisation; and saved time. Verdegem & Verleye (2009) categorised the previous benefits into three groups: access to the service (the service is easily located, easily accessible and cost friendly); use of the service (clear information, comprehensible, reliable and up-to-date; safety issues); and impact of the service (customer-friendly services, one central contact point). Recently, Rowley, (2011) and Millard (2008) provided a list of suggested e-service benefits.

In the e-commerce context; both the IS success and SERVQUAL models directly and indirectly measured the 'benefit' construct. In the SERVQUAL model, studying the gap between users' expectations and experiences leads to improving service quality such as: improved website design, reliability, responsiveness, security/privacy, personalisation, information, and ease of use (Alanezi, Kamil & Basri, 2010). Compared with traditional services, such an improvement in service quality is a potential benefit users may perceive in using e-government services. The IS success model, on the other hand, treats the user benefit construct as an outcome of satisfaction, which goes against the previously discussed theories such as SET and ECT, in which user satisfaction is the resultant output of user cost-benefit analysis. However, *perceived usefulness* and *ease of use* (Adams, Nelson, & Todd, 1992; Segars & Grover, 1993) in the IS success model could be considered as a direct potential benefit of using e-services.

Based on the above mentioned studies, e-service benefit items in this study are grouped into two categories; *tangible* and *intangible* benefits. Tangible benefits involve saving time and saving money, whereas intangible benefits include the quality of information, service, and system. Information quality is concerned with the information provided by an e-service website involving accuracy, currency, and ease of understanding (Alanezi *et al*., 2010; Gilbert *et al*., 2004; Rai *et al*., 2002), timeliness, consistency, relevance and completeness (DeLone & McLean, 2003). Service quality is the overall support provided by the service provider (DeLone & McLean, 2003), or the degree to which a provided service meets the requirements of

11

customers or users (Parasuraman *et al*., 1988). This includes efficiency, fulfilment, system availability and privacy (Zeithaml, Parasuraman, & Malhotra, 2002). Finally, system quality represents the user's perception of the technical performance of the website in information retrieval and delivery. Therefore, it is the interface that connects the users and the government. System quality is related to the performance of an information system in terms of reliability, ease of use, convenience and functionality (Alanezi *et. al*., 2010; Petter, DeLone, & McLean, 2008); stability, flexibility, usefulness and user-friendly interface (Rai *et al*., 2002; Yusuf, Gunasekaran, & Abthorpe, 2004).

2.4.3. *Risk*

In several e-service applications it is impossible to complete the requested service without the acquisition of necessary information (personal or/and financial) from the user. Such applications may lead to higher levels of uncertainty (Pavlou, 2003; Suh & Han, 2003). Personal/ financial data can be misused either by the agency collecting such data or by external third parties; hence, the online sharing of such data is hardly considered safe (Bannister & Connolly, 2011). Accordingly, safety, trust and security are considered as important factors that explain users' acceptance of e-services (Featherman & Pavlou, 2003; Pavlou, 2003). However, safety, trust and security are one side of risk, hence; researchers need to pay more attention to analyzing this construct.

Rowe (1977) defined it as a '*potential for the realization of unwanted, negative consequences of an event*'. More specifically, Dowling & Staelin (1994) and Mitchell *et al*., (1999) defined risk in terms of consumers' perceptions of both uncertainty and magnitude of the possible adverse consequences. Given this broad and specific definition of risk means it is a multidimensional construct (Tsaur, Tzeng & Wang, 1997) which is difficult to measure objectively. Thus, online service literature has focused on users' risk perceptions as a measurement of risk. Perceived risk is defined as the user's subjective expectation of suffering

a loss in pursuit of a desired outcome (Warkentin *et al*., 2002). Numerous studies have explored the role of perceived risk in e-commerce (e.g., Gefen, 2002; Gefen, Karahanna & Straub, 2003; Van Slyke, Belanger & Comunale, 2004). Cunningham (1967) suggests certainty and consequences as two components of perceived risk. Moutinho (1987) divided perceived risk into five categories: functional, physical, financial, social and psychological risks. Later, Featherman & Pavlou (2003); Pires, Stanton & Eckford (2004) and Ueltschy, Krampf & Yannopoulos (2004) further analysed Moutinho's (1987) categories and proposed time risk as an additional dimension of perceived risk. Miyazaki & Fernandez (2001) broke down perceived risk into privacy and security concerns. Suh & Han (2003) identified different sources of risk including: information theft, theft of service, data corruption or information integrity problems, possibility of fraud, and privacy problems. Yang, Jun, & Peterson (2004) proposed different source of risks in any e-service transaction; send information electronically, and sort them electronically. Milne, Rohm, & Bahl (2004) identified three sources of risk: hacking of stored data, interception of online transferred data, and illegal access to stored data in organisational electronic databases.

However, risk perception is significantly different in e-government services as users perceive less risk (Belanger & Carter, 2008). Also, in e-commerce, loss of money and loss of information privacy are two prominent risks that may be expected. Meanwhile, in e-services, the possibility of losing one's information privacy is the most crucial risk that can be incurred since government agencies may be required by law to share users' information with other agencies or with public officers (Yang *et al*., 2004). An additional source of perceived risk in an e-service context may include imposing additional taxes (Bannister & Connolly, 2011).

Researchers are just beginning to empirically explore the role of trust and perceived risk in e-services (Gefen *et al*., 2003; Welch, Hinnant & Moon, 2005). Some studies have included trust or security in broader adoption models, such as the technology acceptance model and the

diffusion of innovation theory (Gefen, 2002; Pavlou, 2003; Warkentin *et al*., 2002). Few, have focused solely on the implications of risk on user satisfaction with e-service provision (Kertesz, 2003; Rotchanakitumnuai, 2008; Udo, Bagchi & Kirs, 2008; Xiaoni & Prybutok, 2005). These studies, among others, have highlighted the importance of ensuring that users can transact online services securely and that their personal information will be kept confidential to increase users' satisfaction levels and e-service adoption rates.

In line with the previous literatures, i.e. Featherman & Pavlou (2003); Pires *et al*., (2004) and Ueltschy *et al*., (2004), this study measured six categories of perceived risk: *financial, performance, social, privacy, personal,* and *time risks*. The sources of financial risk include: keeping records for a long time, wrong payments that need correction, asking for additional payments, and being easy to audit. Performance risk involves: data that can be intercepted by hackers, incorrect submission meaning that more documents or additional payment is needed and slow service. Personal and privacy risks include: safety of personal information and fewer interactions with people. Finally, the source of time risk includes: the perception of e-government services as a waste of time, and/or more training and help are needed.

2.4.4.   Opportunity

The decision to use e-government services is also influenced by opportunity (Lee, Kim & Ahn, 2011). Opportunities are presented by the environment or country within which the e-government service operates (Osman *et al.*, 2011). These arise when a user can realise benefits from the conditions offered by e-government or online services compared to using a conventional service. For example, filling and submitting an online tax return without having to visit a crowded office is a benefit of using e-government services, whereas filing, reporting, and updating or correcting tax records online is an opportunity. Also, interconnecting all public authorities with a one-stop e-services system is a benefit of e-government, as it allows a smooth coordination of service performance by different authorities (Janssen, Kuk & Wagenaar, 2008;

Wimmer, 2002). Such interaction between governments and users can also enhance transparency and make government more accessible (Wescott, Pizarro & Schiavo-Campo, 2001). Also, the impersonal and bureaucratic nature of government may be reduced through actual use (Gauld & Goldfinch, 2006). Furthermore, the non-hierarchical nature of an e-service and its ability to speed up communications with 24/7 access offers a real opportunity and improves intentions to use e-government services (Janssen *et al*., 2008). Additionally, unlike traditional government services, e-government users can personalise (customise) the requested service based on their needs. This is regarded as another opportunity of using e-services, thereby increasing citizens' satisfaction of government services (Gilbert *et al.*, 2004). Finally, access to e-services from different facilities and devices at convenient times and locations is another opportunity provided by e-services. Similarly, users have the opportunity to request and receive the services at the time and place of their choice instead of visiting government offices at a particular location and specified time (Ganesh *et al*., 2010, Lin & Hsieh, 2011; Murphy, 2008). Previous researchers considered these opportunities as benefits due to the lack of clear definitions in the literature of 'opportunities' in an e-government services context.

The above mentioned e-government service opportunities are grouped in this study into two main groups; *e-service support* and *technical* opportunities. E-service support includes: accessing the services at any time and from any place, personalisation of e-services, several delivery periods, responsiveness, reduced bureaucratic process, more attractive, and error correction during a transaction. Technical support includes: interactive feedback between users and government officers, follow-up services through SMS and/or email, several payment methods, updating information during the transaction, reviewing their previous transactions, ease of communication with government officers, and sharing experiences with others.

2.5. Hypotheses development

2.5.1. *Cost - Satisfaction hypothesised relationship*

None of the previous studies in an e-government context tested or investigated the relationship between cost and user satisfaction. Whereas in e-commerce, Hauser, Simester, & Wernerfelt (1994) noted that consumer sensitivity to satisfaction level reduced with increasing costs. Similarly, Jones *et al*. (2007) and Caruana (2004) both found evidence of an interaction between costs and customer satisfaction. Wangenheim's (2003) results show that cost is an important moderator of the relationship between customer satisfaction and customer loyalty. Consistent with these studies it expected that a high cost of using e-services may lead to lower satisfaction levels, which leads us to derive the following hypothesis:

> **H1**: *Cost has a negative relationship with user satisfaction.*

2.5.2. *Benefit - Satisfaction hypothesised relationship*

It is hard to find any study in e-government literature that has investigated or tested the relationship between benefit and user satisfaction. In the e-commerce context, studies have tested the fragmented relationship between consumer satisfactions and benefit dimensions. For example, Lee & Lin (2005) found that website design plays a major role in customer satisfaction. Teo, Srivastava & Jiang (2008) and Xiaoni & Prybutok's (2005) results show that better system quality and better service quality are related to increased user satisfaction. Yoo & Douth (2001) found that the ease of usage dimension is one of the most significant dimensions that influence customer satisfaction. Chiou (2004) shows that perceived value is an important antecedent of overall satisfaction. This encourages us to collect these fragmented relationships into one hypothesis and investigate the relationship between user benefits and their satisfaction level. Therefore, we propose the following hypothesis;

> **H2**: *Benefit has a positive relationship with user satisfaction*

2.5.3. Risk - Satisfaction hypothesised relationship

In an e-commerce context, consumers are more likely to purchase online when they perceive risk as being low (Lee & Tan, 2003). Hence, perceived risk impacts negatively on users' attitudes and satisfaction (Pan & Zinkhan, 2006 and Wolfinbarger & Gilly, 2003). Furthermore, perceived risk negatively affects users' intentions to exchange information and complete transactions (Pavlou, 2003), and accept online services (Hung, Chang & Yu, 2006). On other hand, Taylor & Strutton's (2010) meta-analysis results supported the claim that perceived risk has a strong negative effect on behavioural intentions, while Chiou, (2004) and Hsu (2008) found the same effect on satisfaction. In an e-government context, Sang & Lee (2009) and Warkentin *et al*. (2002) suggest that perceived risk will have the same effect on e-government. Also, Bélanger & Carter's (2008) results indicate that perceived risk negatively affects intentions to use e-services. Based on the aforementioned literature, and in the light of users' reluctance to switch from traditional interaction with government and the need for a better understanding of the impact of risk perceptions on user satisfaction we proposed the following hypothesis;

H3: *Risk has a negative relationship user satisfaction.*

2.5.4. Opportunity - Satisfaction hypothesised relationship

Because few researchers have discussed the benefits of e-service, there is a lack of theoretical support for the relationship between the obtained opportunity from using e-services and user satisfaction. Chatfield (2009) and Willoughby, Gómez, & Lozano (2010) suggested that the provision of 24/7 services, which leads to ease of access to the services at any time and from any place, can attract users and improve their satisfaction levels. Thorbjornsen *et al*. (2002) proposed the same improvement level due to the personalisation and customisation ability of e-services. Building on these two studies and to generalize the impact of opportunity on user satisfaction the following hypothesis is proposed;

H4: *opportunity has a positive relationship with user satisfaction.*

3.   Model scale development

Based on the previously presented literature, we developed, tested, and validated a new scale to assess e-government services success from users' perspectives. Two data collection rounds were completed, with four separate stages of model development which are described below.

3.1.   Stage 1: Scale development

At this stage the previously published academic studies served as a theoretical foundation for scale (questionnaire) development. Hence, the potential items were originally developed based on an intensive literature review, and a final set of 60 items and open-ended questions were retained to provide general comments on content analysis. Care was taken to ensure that each item was short, simple, and addressed a single issue. Items were then reviewed by experts (with PhDs in related areas) to reduce the initial item pool and ensure content validity. Expert judges were exposed to individual items and asked to rate each item as "clearly representative," "somewhat representative," or "not representative" and only items rated clearly or somewhat representative were retained. Items were then evaluated several times in an iterative process based on feedback from these expert judges.

Furthermore, two workshops were conducted in Turkey and the United Kingdom to capture a wider variety of viewpoints, relevance of the proposed questionnaire to the objective of the study and to increase the probability of producing valid measures (Churchill, 1979). In the workshop in Turkey, 20 experts including: e-government public officers; IT specialists and leading professional researchers in the field of e-government were invited on the day following the ICEGEG conference on explorations in e-government and e-governance (Antalya, March, 2010). At this workshop, the questionnaire was distributed to participants for review of the 60 initial items. The updated questionnaire was then corrected and reduced to 49 items that were

again validated at the 2010 Transforming -Government workshop (London, March, 2010). Face validity was also conducted to evaluate the appearance of the questionnaire in terms of readability, consistency of style, and the clarity of the language used. 30 MBA students at the American University of Beirut were invited to conduct the face validity. The students assessed each item in terms of clarity of wording; the likelihood that the target audience would be able to answer it; and finally the layout and style of the questionnaire.

Moreover, since the original questionnaire was developed in the English language and the conventional language of users would be Turkish, the translation-back-translation procedure was performed (Bhalla & Lin, 1987; and Lee *et al*., 2011). To simplify the Turkish wording in the questionnaire, face validity was again conducted for the Turkish version of the questionnaire by incorporating the comments of 235 Turkish respondents and, based on their comments, some final modifications were made. All the manifested variables in the questionnaire were measured using a five-point Likert scale with attributes ranging from 1=strongly disagree to 5=strongly agree.

3.2. Stage 2: Scale refinement

This stage aimed to improve the psychometric properties and ultimately, the validity of the proposed scale, through establishing better internal consistency and including items that discriminate at the desired level of attribute strength (Smith & McCarthy, 1995). Several tests are proposed at this stage such as *exploratory factor* using principal components analysis (PCA) and *reliability analyses*. Also, *confirmatory factor analysis (CFA)* was used to validate the scale factors and reliability analyses, (Hair *et al*., 1998). PCA is used as an initial step in CFA to provide information regarding the maximum number and nature of factors. In using factor analysis for citizen centric research, several issues need to be considered, including subjectivity of answers, sample size, and level of measure. Therefore, factor analysis based on PCA was conducted to investigate the internal structure as well as to determine the smallest

number of factors that could be used to best represent the interrelations among the variables. Factor analysis identifies the central underlying constructs (factors) of a scale and their manifested variables; hence the factor loadings represent the weight of a questionnaire item (manifest) on a particular factor; whereas reliability analysis ensures that all items on the scale, or within a factor, measure the same construct.

3.2.1.   *Sample and procedures*

All Turkish e-government service users were considered as the initial sample frame and were contacted to participate in this study. Thus, within the e-services users who participated in the initial sample frame, we could ensure that they were IT literate. However, the surveyed e-services were heterogeneous in terms of e-system maturity level. An attempt was made to divide e-services in Turkey into three categories of homogenous e-services from users' perspectives rather than maturity perspectives (i.e. *Informational, Interactive/Transactional* and *Personalised* e-government services). Informational e-government services provide public content and do not require any authentication in order to access the e-service. This category comprised only one e-government service called *content pages for citizen information.* Interactive/Transactional e-government services require authentication for filling-out forms, contacting agency officials, and/or requesting specific services and special appointments. This category includes e-government services such as: *online inquiry for consumer complaints*; *application for military services real person to receive information*; and *reservation for meeting members of parliament*. Personalised e-government services do require authentication and allow users to customise the content of the e-services, conduct financial transactions and pay online to receive e-government services including *student education information*; and *my personal page*.

3.2.2.   *Online survey*

The online survey was hosted on a central server in Turkey (TurkSat e-government portal). The survey was not set up as an open link or a general announcement, therefore the issue of random responding did not arise. Furthermore, using an online survey limits the respondent base to computer users. The respondents were asked to voluntarily complete the questionnaire following recent use of an e-government service. Respondents were informed that the survey is for academic research purposes and were assured of confidentiality, and the server did not retain their IP addresses, which potentially compromise their identity. Such anonymizing steps are also mentioned clearly at the beginning of the survey to reassure the respondents. The survey was left open for six months (June- November 2010); one dataset was gathered every three months.

Since it is an open survey, it is not possible to obtain a response rate. A total of 3506 completed responses were obtained at the end of the data collection period, and data cleaning revealed 2785 usable responses (2258 informational; 243 interactive/transactional; and 284 personalized e-government services). It is worth noting that this sample size was sufficient to run our analysis as the Turkish population is around 70 million, of which 9% are Information and Communication Technology (ICT) users, thus leading to an estimate of 6.3 million ICT users. The accepted sample size for a population of 10 million with 95% level of certainty and 2% margin of error is estimated to be 2400 (Saunders et al., 2007). Analysis of demographical data on respondents showed that 45% had a bachelor's degree or higher; they ranged in age from 17 to 56; 67% had experience of working with a computer and/or the internet; and 94.4% used the current e-government services at least once a month, while 5.6.% used it once or several times per annum. The differences in responses between the two collected datasets were examined to check for non-response bias (Armstrong & Overton, 1977). No significant differences ($p \leq 0.05$) were found in the datasets, suggesting non-response bias was not a

problem in the data. Finally, Skewness and kurtosis values were computed to test normality. The results imply that the data in this study in general are not significantly different from the norm.

3.2.3. *Exploratory factor analysis*

Using the personalised e-service user dataset, principal components analysis (PCA) with Varimax rotation was performed on the initial 49 items, employing a factor weight of 0.50 as the minimum cut-off as reported in Table 2. It can be seen that each manifest variable has a loading greater than 0.5 on its associated factor. Thus, the relatively high factor loadings suggest the proposed model has four fairly atypical constructs (factors). Also, the Kaiser-Meyer-Olkin (KMO) test had a value of 0.98, exceeding the minimum value of 0.6 which indicated a high sampling adequacy for satisfactory factor analysis to be continued. Moreover, the Bartlett test indicated a highly significant level with ($p \leq 0.01$), indicating that the variables had correlations with each other, and that what was needed was to find an underlying factor to represent a group of variables. Again, this result provided additional support to proceed to PCA. The PCA results produced four factors composed of the 49 variables with 73.46% explained of the total variance.

The combined reliability of the 49-item scale was quite high (0.93) and the coefficient alphas for the subscales were all above 0.80, indicating high internal consistency. The item-to-total correlations ranged from 0.53 to 0.72 (above the 0.4 value suggested by Hair *et al*., 1998). The 49 items that hang together in each factor are reported in Table 2 and each factor is explained as follows:

Factor 1- (benefit and opportunity factor); this accounted for 41.82% of the total variation. It comprised 35 variables. 31 variables focused on both user benefits and opportunities. The other four variables focused on cost and also had good loadings on factor 2. Therefore, they were removed from factor 1.

Factor 2- (cost- money factor); this accounted for 12.73% of the total variation. It consisted of seven variables with a focus on payment cost to use the e-government service.

Factor 3- (cost-time factor); this accounted for 11.79% of the total variation. It comprised six variables with a focus on time spent on using the e-government service.

Factor 4- (risk factor); this accounted for 7.12% of the total variation. It consisted of five variables. It focuses on the potential risk(s) of using the e-government service.

<div align="center">***<<Insert Table 2>>***</div>

3.2.4. *Confirmatory factor analysis (CFA)*

i) *Measurement analysis*

The final factors and their manifests of PCA were used to run the CFA to further improve the psychometric measurement properties of the scale (Arnold & Reynolds, 2003). Table 3 shows the computed CFA developed factors and their manifested variables. The results indicate that the fit index values for the measurement models met the criteria for both *absolute fit* and *incremental fit*. The absolute fit indices determine how well the proposed theory (or model) fits the sample data (McDonald & Ho, 2002) and demonstrates which proposed model has the most superior fit (Hooper, Coughlan & Mullen, 2008). The incremental fit indices compare the data-model fit of the proposed model relative to that of a baseline model, which is a single-factor model without measurement errors. For these models the null hypothesis is that all variables are uncorrelated (McDonald & Ho, 2002).

The results of absolute fit indices revealed acceptable fit level; i.e. the value of $X^2/df = 2.94$, which is below the desired cut-off value of 3.0 as recommended. The Root Mean Square Residual (RMSR/RMR) and Root Mean Square Error of Approximation (RMSEA) were also below the ≤0.08 as recommended too. Furthermore, the results of incremental fit indices revealed acceptable fit level; i.e. Normed Fit Index (NFI) and Comparative Fit Index (CFI) were 0.87, and 0.91, respectively. All Modification Indices (MIs) were low, and squared

multiple correlations (SMCs) ranged from 0.36 to 0.78. Hence, the CFA results suggest that the model has a satisfactory fit and that all of the items are valid in reflecting their corresponding constructs.

ii)   Structural analysis

The next step in the model estimation is to examine the significance of each hypothesised path. The results indicate that the four constructs (cost, benefit, risk and opportunity) explained 76% of the variance in users' satisfaction. In this model, users' satisfaction is 76% explained with construct coefficients: benefit (β =0.59), opportunity (β =0.68), cost (β = -0.36) and risk (β = -0.11). All items in the cost, benefit, risk and opportunity constructs significantly explain the variance of the four constructs toward e-government service users' satisfaction.

Figure 1 hypotheses, H1 and H3, are supported as cost and risk have a significant negative effect on users' satisfaction. This means that both cost and risk are significant predictors of users' satisfaction. The relatively weak negative effect of risk (β = -0.11) compared to the cost effect (β = -0.36) suggests that cost is more important from a user point of view than risk. Similarly, H2 and H4 also supported the hypothesis that benefit and opportunity have a significant, positive effect on users' satisfaction. The positive, significant relationships between benefit and opportunity suggest that both benefit and opportunity are important predictors of user satisfaction. However, opportunity was a slightly stronger predictor of satisfaction (β = 0. 68) than benefit (β = 0. 59). The overall results mean that both cost and risk constructs will reduce user satisfaction, whereas benefit and opportunity will improve user satisfaction.

3.3.   Stage 3: Scale validation

The objective of this stage was to further examine the construct validity of the COBRA scale. Thus, the confirmed scale of 49 items, four construct from the previous stage is applied

to the interactive/transactional e-government service randomly selected users. The sample included 284 users.

To assess the proposed scale's construct validity, first, a CFA was performed and results showed that all indices surpassed the acceptable level; i.e. X^2/df = 1.98 ($p <0.01$); RMSEA= 0.051, GFI = 0.93, NFI = 0.93, CFI = 0.96). Second, convergent validity was assessed by comparing the factor loading with standard error for all factors, and the results showed that all factor loadings were greater than twice their standard error (Anderson & Gerbing 1988), which confirmed the scale convergent validity. Also, the average variances extracted (AVEs) in the four constructs were all above the accepted level of 0.60 (Bagozzi, Yi, and Phillips, 1991). The common results of this test indicate high levels of convergence among the items in measuring their respective constructs. Finally, Figure 1 hypotheses, H1- H4, were also supported and the overall results indicated that both the cost and risk constructs had negative relationships while benefit and opportunity had a positive relationship with user satisfaction.

3.4. Stage 4: Replication and generalizability

The purpose of this stage is to apply the validated COBRA model and the proposed scale to a different sample in an attempt to reduce error due to capitalisation of chance in the second and third stages (MacCallum, Roznowski, & Necowitz, 1992). If the same results are obtained from the new dataset, we can generalise the COBRA model as an alternative model to assess the success of e-services from user perspectives. While we used general and cross-e-services samples in Stages 2 and 3, we used a specific e-service sample in Stage 4 to assess COBRA's generalizability and applicability to specific e-services. Data from informational e-service users was used for this replication that included 2258 valid responses. This sample is further divided into subsamples (splits), based on users' demographic characteristics. Consequently, a total of six splits are generated from the survey responses for cross validations as illustrated in Table 4.

Using individual respondents as observations, here we describe the results of estimating the COBRA model for the six measured sub-samples. In particular, we tested the general applicability of the model; the relative importance of the benefit and opportunity constructs, and the relative importance of the cost and risk constructs.

General applicability of the model

Overall, we expected the COBRA model to be generally applicable to multiple levels as the model and measures are designed to provide this generality. This prediction was examined through several indicators.

1. Whether the estimated path coefficients are significant and in the predicted directions: results showed that the model's path coefficient was significant and in the predicted direction;

2. The model's ability to explain the importance of latent variables in the model, especially overall user satisfaction: we found that the estimated model explained a considerable proportion of the variance; for overall user satisfaction, R^2 measures range from 0.67 for daily frequency of use to 0.78 for secondary school or lower education.

3. Confirmatory factor analysis: The CFA was computed for all the samples (splits) and results showed that all coefficients surpassed the 0.70 level for all items within the scale. The combined reliabilities for all items was quite high in all models, indicating a good fit for all the splits (results are presented in Table 4);

4. Convergent and discriminant validity: Factor loadings of the CFAs for each sample split model surpassed twice their standard error and the AVEs of the four dimensions were above the acceptable value. Further, factor loadings were significant in all models. All the tests provided evidence of convergent validity. Cross-construct correlations

were significantly less than 1.0 in all models (Bagozzi & Heatherton, 1994). Finally, the X^2 difference test, for all pairs of factors in each model, resulted in a significant difference. These tests all provided sufficient evidence of discriminant validity. All resulting model fits were acceptable; loadings of the paths were significant;

Benefit- versus opportunity-driven satisfaction

The impact of opportunity on overall customer satisfaction was greater than that of the benefit value in each of the six sub-samples. The average of direct effect of opportunity on user satisfaction was 0.67, whereas the direct effect of benefit on user satisfaction was 0.58.

Cost- versus risk-driven satisfaction

The impact of cost on overall customer satisfaction was greater than that of the risk value in each of the six sub-samples. The average direct effect of cost on user satisfaction was -0.26, whereas the direct effect of risk on user satisfaction was -0.04.

4.   Discussion and Conclusions

While e-service involves many stakeholders, each of them has different interests and objectives that would have an impact on the success of e-services. Citizens (users) are the primary and most important stakeholder of e-government activities. Accordingly, their satisfaction plays a central role in e-service success. User satisfaction from e-service has been the focus of numerous studies that proposed different frameworks and approaches. Although each of them focused on specific aspects of evaluation and used different evaluation models, they succeeded in identifying some of key performance indicators (KPIs) that influence user satisfaction, but failed to address others. To rectify the shortcomings of these models this research attempted to provide a holistic evaluation using insights and critical analysis into user satisfaction. Regrouping the identified KPIs and proposing additional constructs allowed the research to provide a comprehensive evaluation of satisfaction. Reconstructing user benefit and adding

user cost show that economic theory (cost-benefit) is a useful tool to explain user satisfaction. Furthermore, using the risk-opportunity analysis provides an insight on investigation of user satisfaction. Hence the proposed methodology (COBRA) is designed, in particular, to focus analysis on the cost, opportunity, benefit and risk baseline. Accordingly, any initiative, changes, or implications of those changes can be measured over time.

To assess e-services using the COBRA model a scale is developed, tested, refined, and validated through four separate stages of model development on a sample of e-services users in Turkey (TurkSat e-government portal). Thus, COBRA can be used to assess the success of diverse types of e-service from the user perspective in Turkey and elsewhere. It is worth noting that the COBRA model does have a counterpart in other models and approaches for assessing the success of e-government services, such as the VMM. The proposed model herein provides one more dimension (opportunity) than that proposed by VMM. A similar comparison can be made between the model reported herein and the IS success model. Unlike the IS success model that treats user benefits as an outcome, the proposed model treats them as an output of e-service, since the benefit of using any service is an intermediation and satisfaction is the final outcome. Furthermore, the proposed model is more comprehensive than the SERVQUAL model. It should be stressed that the proposed model provides a comprehensive evaluation for any e-service, since it encompasses features that evaluate e-services' value, quality, and opportunity. Finally, although there is no previous study that directly applied the suggested model, the results of the present study are consistent with those reported by previous studies such as Bertot, Jaeger & McClure (2008); Foley (2008); Jang (2010); Rotchanakitumnuai (2008); Udo *et al.* (2008). It is also in line with those of DeLone & McLean (2003); Wang & Liao (2008). Therefore, the following conclusions can be drawn from the present study:

1. The proposed COBRA model is confirmed as a useful tool for evaluating the success of e-government services from the users' perspective.

2. The initial results of this study show that the type of e-service is a key antecedent to user satisfaction where different e-service groups give a different fit. It is therefore recommended segmenting e-government services together with their maturity level and then to assess user satisfaction for each segment.

4.1. Theoretical implications

This study makes the following theoretical contributions:

1. It proposes and empirically tests a Cost-Benefit and Risk-Opportunity Analysis (COBRA) framework for evaluating e-government service from a user perspective. Using both inductive and deductive methods, this study contributes theoretically to the e-service evaluation domain by developing a conceptual model that integrates existing theories with empirical findings. Compared to past studies, current results offer more complete coverage and understanding of e-government service success. COBRA can be seen as the strategic measurement framework by analogy to the well-known SWOT qualitative strategic management approach. It can be generalised to other perspectives at the macro and micro levels without any loss of generality.

2. The current study contributes to the existing literature by testing and validating COBRA with data from different samples. The testing and validating involved vigorous psychometric scale development procedures and methodologies at each stage. Accordingly, solid empirical evidence to support the robustness of the developed scale is provided. Furthermore, this study contributes to scale development research by replicating and validating the scale across e-government services and user traits, confirming the stability of the factor structure across various settings. Thus, it is the first study to perform replications across various user traits in e-service success scale development. Results show that COBRA is stable across e-government service groups and user traits, demonstrating strong generalizability;

3.   Although the literature focuses on fragmented key performance indicators, this study integrates and develops new indicators to assess e-government service success from users' perspective similar studies are being conducted from the engaging providers' perspective micro level as well as the macro level at cross-country level, (Osman et al. 2013). A reference process model for citizen-centric evaluation of e-government services can be found in Tsohou et al. (2012).

4.2.   Managerial implications

Policy makers have a responsibility to provide e-government services that engage and satisfy users. One of the challenging tasks that policy makers face is how to enhance user satisfaction; this study helps them and makes the following managerial contributions:

1.   Since user satisfaction is the primary objective for e-government service providers and policy makers, COBRA provides an instrument to obtain a comprehensive assessment of user satisfaction. Compared to the previously proposed models and frameworks such as SERVQUAL or VMM, the COBRA model can provide a holistic assessment of user satisfaction, hence, practitioners can use it to conduct their assessment of e-government users' satisfaction level;

2.   The insight analysis showings how such satisfaction can be reached through a balance between the four e-service dimensions: cost; benefit; risk; and opportunity, offers a practical means for policy makers to evaluate the success of e-government services; and

3.   Similar results were obtained from replications of the same analysis using multiple samples. The consistency of these results emphasizes the need for policy makers and service providers to give more importance to these dimensions. Such analysis allows managers to identify problem areas and concentrate resources on improving those areas. Based on these capabilities, better policies can be developed for unsuccessful e-government services;

4. COBRA's survey instrument was designed to be used by policy makers to provide them with feedback about e-government service success, and to validate requests for increased resources to areas in need of improvement. Therefore, in cases where policy makers cannot secure sufficient resources to satisfy users' demands, the collected information available through COBRA will assist them to target the most critical service areas for users.

4.3. Limitations and future research

Our study has some limitations which also offer avenues for future research. First, the COBRA model was tested and validated in Turkey. The same model should be evaluated in other countries; however, researcher should be cautious in its application. Using international variation to further validate any model has limitations; user satisfaction may be related to other unobserved country-factors, such as general cultural features or e-government services development strategies and levels. Second, in the COBRA model, the cost construct is tangible and can be measured. However, due to technical problems with the TurkSat portal we were unable to collect quantitative data. This forced us to measure this construct through qualitative data. An extension to the current study could be carried out using the quantitative data to measure the cost that will help to get a better understanding of the cost-satisfaction relationship.

Third, like other studies, this study is limited to identifying the most important factors that predict user satisfaction and ultimately e-government service success, so researchers are invited to build on the current study and provide an insight analysis and useful information through using operational research and/or data mining techniques. For example, data envelopment analysis technique is a useful tool for assessing, monitoring and controlling any e-service, (Osman et al. 2011a, Osman, Anouze & Emrouznejad, 2014). Furthermore, a classification and regression tree (CART), which is a data mining technique, is a useful tool to

classify e-services and/or users according to their satisfaction level, hence policy makers can

use this information by targeting unsuccessful e-government services and/or unsatisfied users.

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Appendices

Table 1: Summary of previous literature

Study	Measurement Type	Performed methodology	Models and associated variables
Alanezi, Kamil and Basri (2010)	Service Quality	Conceptual model	Modified version of SERVQUAL that includes seven dimensions and 26 items. The seven dimensions in this scale are: website design, reliability, responsiveness, security/ privacy, personalisation, information and ease of use.
Batini, Viscusi, and Cherubini (2009)			**GovQual** considers a wide set of quality dimensions: efficiency; effectiveness; accessibility; and accountability
Henriksson *et al*. (2007)		Conceptual model	The instrument questions in the e-government website (**eGwet)** are grouped into six categories to evaluate the quality of government websites: security / privacy; usability; content; services; citizen participation; and features (the presence of commercial advertising, external links and advanced search capabilities)
Horan and Abhichandani (2006)		Structured equation model	**EGOVSAT** model consists of: utility; efficiency, customisation, reliability (whether the website functions appropriately in terms of technology as well as accuracy of the content) and flexibility.
Kaisara and Pather (2009)		Descriptive statistics	The e-service quality (**eSQ)** model includes factors (Information quality, security/trust, communication, site aesthetics, design, access)
Lee, Kim, and Ahn (2011)		Logistic regression	The model includes: tangible factors (i.e .equipment); reliability; responsiveness; assurance; empathy; promptness of service and overall satisfaction with the filing process to measure the offline service quality. They include 6 control variables.
Lin, Fofanah and Liang (2011)		Structured equation model	TAM
Magoutas, and Mentzas, (2010)		Two-sample Z-test	SALT model includes the following factors: Portal's usability, Forms interaction, Support mechanisms and Security
Magoutas *et al*. (2010)		Two-Sample one-tailed Z-test	Model for Adaptive Quality Measurement (*MAQM*) : The model includes 6 quality factors and 33 quality dimensions.
Papadomichelaki and Mentzas (2012)		Structured equation model	*e-GovQual:* Includes 21 quality attributes classified under four quality dimensions: *Efficiency*; *Trust*; *Reliability*; and *Citizen Support*.

Study	Measurement Type	Performed methodology	Models and associated variables
Rotchanakitumnuai (2008)		Content analysis	**E-GOVSQUAL-RISK model** includes service quality (service design; website design; technology support; and user support) perceived risk (performance risk; privacy risk; social risk; time risk and financial risk)
Xenia and Mentzas (2009)		Structured equation model	**e-GovQual** model includes 25 quality variables (55 questions) classified under 4 quality factors: reliability, efficiency, citizen support and trust.
Fresh Minds (2006)	**Traditional National Satisfaction Index**	Surveys and statistical analysis	ACSI: American customer satisfaction index
Kim, Im and Park (2005)		Statistical reporting and tools	**g-CSI** model is based on customer satisfaction index of e-government model. It is an integrated model of customer satisfaction index in Korea and American customer satisfaction index. It is based on perceived quality (information, process, customer service, budget execution, and management innovation) and user expectation to contribute to user satisfaction as a moderator for subsequent user complaints and trust and re-use.
Shyu and Huang (2011)	**e-government Success**	Case study	Perceived enjoyment; Perceived e-government learning value; Perceived usefulness; Perceived ease of use; Attitude; Behavioural intention; and Actual usage
Verdegem and Verleye (2009)		Structured equation model	**E-Government acceptance model;** Communication about services; currency of information; security; help or guidance; personal contact and centralisation/integration. The indicators are clustered into three groups: 1) access to service; 2) use of service; 3) impact of service.

Table 2: Principle Component Analysis and Loading of Component Matrix

Dimension	Item	Final Label	Cronbach's Alpha	Loadings			
				1	2	3	4
D 1	The e-service is easy to find	**Benefit**	**0.96**	0.81			
	The e-service is easy to navigate			0.84			
	The description of each link is provided			0.79			
	The e-service information is easy to read			0.72			
	The e-service is accomplished quickly			0.84			
	The e-service requires no technical knowledge			0.70			
	The instructions are easy to understand			0.83			
	The e-service information is well organized			0.87			
	The drop-down menu facilitates completion of the e-service			0.86			
	New updates on the e-service are highlighted			0.81			
	The requested information is uploaded quickly			0.80			
	The information is relevant to my service			0.83			
	The e-service information covers a wide range of topics			0.75			
	The e-service information is accurate			0.73			
	The e-service operations are well integrated			0.84			
	The e-service information is up-to-date			0.75			
	The instructions on performing e-service are helpful			0.82			

Dimension	Item	Final Label	Cronbach's Alpha	Loadings 1	2	3	4
	The referral links provided are useful			0.79			
D 11	The Frequently Asked Questions (FAQs) are relevant	Opportunity	0.94	0.76			
	The provided multimedia services facilitate contact with e-service staff			0.71			
	I can share my experiences with other e-service users			0.67			
	The e-service can be accessed at any time			0.73			
	The e-service can be reached from anywhere			0.69			
	The information needed for using the e-service is accessible			0.78			
	The e-service points me to the place of errors, if any, during a transaction				0.68		
	The e-service allows me to update my records online				0.66		
	The e-service can be completed incrementally (at different times)				0.68		
	The e-service offers tools for users with special needs (touch screen)				0.61		
	The information is provided in different languages				0.51		
	The e-service provides a			0.61			
	There is a strong incentive for using e-service				0.63		
D 2	Using the e-service saved me time	Cost money	.093	0.78	0.50		
	Using the e-service saved me money			0.67	0.51		

Dimension	Item	Final Label	Cronbach's Alpha	Loadings			
				1	2	3	4
	The e-service removes any potential under table cost to get the service				0.60		
	The e-service reduces the bureaucratic process				0.61		
	The password and renewal costs of e-service are reasonable			0.52	0.46		
	The internet subscription cost is reasonable			0.51	0.43		
	The e-service reduces my travel costs to get the service				0.59		
D 3	It takes a long time to arrange access to the e-service	Cost time	0.91			0.77	
	It takes a long-time to upload the e-service homepage					0.86	
	It takes a long-time to find my needed information					0.84	
	It takes a long-time to download/ fill the e-service application					0.86	
	It takes several attempts to complete the service due to system breakdowns					0.83	
	It takes a long-time to acknowledge the completion of e-service.					0.86	
D 4	I am afraid my personal data may be used for other purposes	Risk	0.89				0.74
	E-service obliges me to keep a record of documents in case of future audit						0.69
	The e-service may lead to a wrong payment that needs further correction						0.71

Dimension	Item	Final Label	Cronbach's Alpha	Loadings 1	2	3	4
	I worry about conducting transactions online requiring personal financial information						0.74
	Using e-service leads to fewer interactions with people						0.50
Kaiser-Meyer-Olkin (KMO Test				**0.98**			
Bartlett' Sphericity Test (df)				**56687 (153)**			

Table 3: Confirmatory factor analysis (CFA) and the final COBRA scale

| Item	Item Loadings	Squared Multiple Correlation
The e-service is easy to find	0.97	**0.67**
The e-service is easy to navigate	0.92	
The description of each link is provided	0.90	
The e-service information is easy to read (font size, colour, …)	0.96	
The e-service is accomplished quickly	0.89	
The e-service requires no technical knowledge	0.94	
The instructions are easy to understand	0.91	
The e-service information is well organized	0.97	
The drop-down menu facilitates completion of the e-service	0.96	
New updates on the e-service are highlighted	0.92	
The requested information is uploaded quickly	0.88	
The information is relevant to my service	0.94	
The e-service information covers a wide range of topics	0.96	
The e-service information is accurate	0.92	
The e-service operations are well integrated	0.91	
The e-service information is up-to-date	0.95	
The instructions on performing the e-service are helpful	0.91	
The referral links provided are useful	0.89	
The Frequently Asked Questions (FAQs) are relevant	0.94	**0.42**
The provided multimedia services facilitate contact with e-service staff	0.91	

Item	Item Loadings	Squared Multiple Correlation
I can share my experiences with other e-service users	0.97	
The e-service can be accessed any time	0.96	
The e-service can be reached from anywhere	0.92	
The information needed for using the e-service is accessible	0.94	
The e-service points me to errors during a transaction	0.96	
The e-service allows me to update my records online	0.92	
The e-service can be completed incrementally (at different times)	0.91	
The e-service offers tools for users with special needs (touch screen)	0.95	
The information is provided in different languages (Arabic, English)	0.91	
The e-service provides a summary report on completion	0.89	
There is a strong incentive for using e-services	0.90	
Using the e-service saved me time	0.96	**0.53**
Using the e-service saved me money	0.89	
The e-service removes any potential under table cost to get the service	0.94	
The e-service reduces the bureaucratic process	0.91	
The password and renewal costs of e-service are reasonable	0.97	
The internet subscription cost is reasonable	0.91	
The e-service reduces my travel costs to get the service	0.95	
It takes a long time to arrange an access to the e-service	0.91	**0.73**
It takes a long-time to upload the e-service homepage	0.89	
It takes a long time to find my needed information	0.90	
It takes a long time to download/ fill the e-service application	0.88	
It takes several attempts to complete the service due to system break-downs	0.92	
It takes a long time to acknowledge the completion of e-service.	0.95	
I am afraid my personal data may be used for other purposes	0.84	**0.38**
E-service obliges me to keep a record of documents in case of future audit	0.94	
The e-service may lead to a wrong payment that needs further correction	0.85	
I worry about conducting transactions online requiring personal financial information	0.88	
Using e-service leads to fewer interactions with people	0.83	

Table 4: Cross validation results

Sample split	Sample Size	X^2/df	GFI	CFI	NFI	RMSEA

Education						
Secondary school or lower	1066	4.88	0.89	0.92	0.94	0.073
Bachelor's degree or higher	1192	0.80	0.83	0.88	0.89	0.089
Frequency of use						
Daily	519	3.74	0.85	0.89	0.91	0.061
Few times a week	975	5.28	0.89	0.90	0.92	0.075
Less than or once a month	764	4.08	0.84	0.87	0.89	0.065
Use of service						
Less than 6 years	732	3.69	0. 81	0.85	0.87	0.048
6 - 10 years	775	4.26	0.83	0.86	0.89	0.077
More than 10 years	751	3.14	0.89	0.91	0.93	0.073

List of Figures
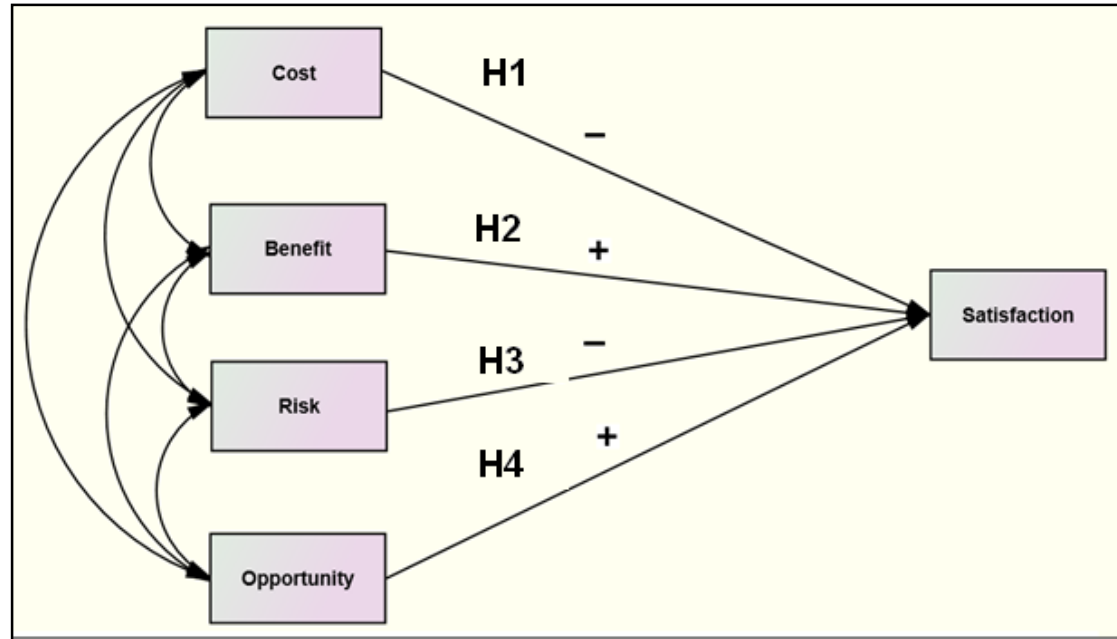
Figure 2: The COBRA model for user satisfaction

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Study	Measurement Type	Performed methodology	Models and associated variables
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Batini, Viscusi, and Cherubini (2009)			**GovQual** considers a wide set of quality dimensions: efficiency; effectiveness; accessibility; and accountability
Henriksson *et al.* (2007)		Conceptual model	The instrument questions in the e-government website (**eGwet)** are grouped into six categories to evaluate the quality of government websites: security / privacy; usability; content; services; citizen participation; and features (the presence of commercial advertising, external links and advanced search capabilities)
Horan and Abhichandani (2006)		Structured equation model	**EGOVSAT** model consists of: utility; efficiency, customisation, reliability (whether the website functions appropriately in terms of technology as well as accuracy of the content) and flexibility.
Kaisara and Pather (2009)		Descriptive statistics	The e-service quality (**eSQ**) model includes factors (Information quality, security/trust, communication, site aesthetics, design, access)
Lee, Kim, and Ahn (2011)		Logistic regression	The model includes: tangible factors (i.e .equipment); reliability; responsiveness; assurance; empathy; promptness of service and overall satisfaction with the filing process to measure the offline service quality. They include 6 control variables.
Lin, Fofanah and Liang (2011)		Structured equation model	TAM
Magoutas, and Mentzas, (2010)		Two-sample Z-test	SALT model includes the following factors: Portal's usability, Forms interaction, Support mechanisms and Security
Magoutas *et al.* (2010)		Two-Sample one-tailed Z-test	Model for Adaptive Quality Measurement (*MAQM*) : The model includes 6 quality factors and 33 quality dimensions.
Papadomichelaki and Mentzas (2012)		Structured equation model	*e-GovQual:* Includes 21 quality attributes classified under four quality dimensions: *Efficiency*; *Trust*; *Reliability*; and *Citizen Support*.
Rotchanakitumnuai (2008)		Content analysis	**E-GOVSQUAL-RISK model** includes service quality (service design; website design; technology support; and user support) perceived risk (performance risk; privacy risk; social risk; time risk and financial risk)

Study	Measurement Type	Performed methodology	Models and associated variables
Xenia and Mentzas (2009)		Structured equation model	**e-GovQual** model includes 25 quality variables (55 questions) classified under 4 quality factors: reliability, efficiency, citizen support and trust.
Fresh Minds (2006)	**Traditional National Satisfaction Index**	Surveys and statistical analysis	ACSI: American customer satisfaction index
Kim, Im and Park (2005)		Statistical reporting and tools	**g-CSI** model is based on customer satisfaction index of e-government model. It is an integrated model of customer satisfaction index in Korea and American customer satisfaction index. It is based on perceived quality (information, process, customer service, budget execution, and management innovation) and user expectation to contribute to user satisfaction as a moderator for subsequent user complaints and trust and re-use.
Shyu and Huang (2011)	**e-government Success**	Case study	Perceived enjoyment; Perceived e-government learning value; Perceived usefulness; Perceived ease of use; Attitude; Behavioural intention; and Actual usage
Verdegem and Verleye (2009)		Structured equation model	**E-Government acceptance model;** Communication about services; currency of information; security; help or guidance; personal contact and centralisation/integration. The indicators are clustered into three groups: 1) access to service; 2) use of service; 3) impact of service.

Table 2: Principle Component Analysis and Loading of Component Matrix

Dimension	Item	Final Label	Cronbach's Alpha	Loadings			
				1	2	3	4
D 1	The e-service is easy to find	**Benefit**	**0.96**	0.81			
	The e-service is easy to navigate			0.84			
	The description of each link is provided			0.79			
	The e-service information is easy to read			0.72			
	The e-service is accomplished quickly			0.84			
	The e-service requires no technical knowledge			0.70			
	The instructions are easy to understand			0.83			
	The e-service information is well organized			0.87			
	The drop-down menu facilitates completion of the e-service			0.86			
	New updates on the e-service are highlighted			0.81			
	The requested information is uploaded quickly			0.80			
	The information is relevant to my service			0.83			
	The e-service information covers a wide range of topics			0.75			
	The e-service information is accurate			0.73			
	The e-service operations are well integrated			0.84			
	The e-service information is up-to-date			0.75			
	The instructions on performing e-service are helpful			0.82			
	The referral links provided are useful			0.79			
D 11	The Frequently Asked Questions (FAQs) are relevant	**Opportunity**	**0.94**	0.76			
	The provided multimedia services facilitate contact with e-service staff			0.71			
	I can share my experiences with other e-service users			0.67			
	The e-service can be accessed at any time			0.73			
	The e-service can be reached from anywhere			0.69			
	The information needed for using the e-service is accessible			0.78			
	The e-service points me to the place of errors, if any, during a transaction				0.68		
	The e-service allows me to update my records online				0.66		
	The e-service can be completed incrementally (at different times)				0.68		

Dimension	Item	Final Label	Cronbach's Alpha	Loadings			
				1	2	3	4
	The e-service offers tools for users with special needs (touch screen)				0.61		
	The information is provided in different languages				0.51		
	The e-service provides a			0.61			
	There is a strong incentive for using e-service				0.63		
D 2	Using the e-service saved me time	Cost money	.093	0.78	0.50		
	Using the e-service saved me money			0.67	0.51		
	The e-service removes any potential under table cost to get the service				0.60		
	The e-service reduces the bureaucratic process				0.61		
	The password and renewal costs of e-service are reasonable			0.52	0.46		
	The internet subscription cost is reasonable			0.51	0.43		
	The e-service reduces my travel costs to get the service				0.59		
D 3	It takes a long time to arrange access to the e-service	Cost time	0.91			0.77	
	It takes a long-time to upload the e-service homepage					0.86	
	It takes a long-time to find my needed information					0.84	
	It takes a long-time to download/ fill the e-service application					0.86	
	It takes several attempts to complete the service due to system breakdowns					0.83	
	It takes a long-time to acknowledge the completion of e-service.					0.86	
D 4	I am afraid my personal data may be used for other purposes	Risk	0.89				0.74
	E-service obliges me to keep a record of documents in case of future audit						0.69
	The e-service may lead to a wrong payment that needs further correction						0.71
	I worry about conducting transactions online requiring personal financial information						0.74
	Using e-service leads to fewer interactions with people						0.50
Kaiser-Meyer-Olkin (KMO Test				0.98			
Bartlett' Sphericity Test (df)				56687 (153)			

Table 3: Confirmatory factor analysis (CFA) and the final COBRA scale

Item	Item Loadings	Squared Multiple Correlation
The e-service is easy to find	0.97	**0.67**
The e-service is easy to navigate	0.92	
The description of each link is provided	0.90	
The e-service information is easy to read (font size, colour, …)	0.96	
The e-service is accomplished quickly	0.89	
The e-service requires no technical knowledge	0.94	
The instructions are easy to understand	0.91	
The e-service information is well organized	0.97	
The drop-down menu facilitates completion of the e-service	0.96	
New updates on the e-service are highlighted	0.92	
The requested information is uploaded quickly	0.88	
The information is relevant to my service	0.94	
The e-service information covers a wide range of topics	0.96	
The e-service information is accurate	0.92	
The e-service operations are well integrated	0.91	
The e-service information is up-to-date	0.95	
The instructions on performing the e-service are helpful	0.91	
The referral links provided are useful	0.89	
The Frequently Asked Questions (FAQs) are relevant	0.94	**0.42**
The provided multimedia services facilitate contact with e-service staff	0.91	
I can share my experiences with other e-service users	0.97	
The e-service can be accessed any time	0.96	
The e-service can be reached from anywhere	0.92	
The information needed for using the e-service is accessible	0.94	
The e-service points me to errors during a transaction	0.96	
The e-service allows me to update my records online	0.92	
The e-service can be completed incrementally (at different times)	0.91	
The e-service offers tools for users with special needs (touch screen)	0.95	
The information is provided in different languages (Arabic, English)	0.91	
The e-service provides a summary report on completion	0.89	
There is a strong incentive for using e-services	0.90	
Using the e-service saved me time	0.96	**0.53**
Using the e-service saved me money	0.89	
The e-service removes any potential under table cost to get the service	0.94	
The e-service reduces the bureaucratic process	0.91	
The password and renewal costs of e-service are reasonable	0.97	
The internet subscription cost is reasonable	0.91	
The e-service reduces my travel costs to get the service	0.95	
It takes a long time to arrange an access to the e-service	0.91	**0.73**
It takes a long-time to upload the e-service homepage	0.89	
It takes a long time to find my needed information	0.90	
It takes a long time to download/ fill the e-service application	0.88	
It takes several attempts to complete the service due to system break-downs	0.92	
It takes a long time to acknowledge the completion of e-service.	0.95	
I am afraid my personal data may be used for other purposes	0.84	**0.38**
E-service obliges me to keep a record of documents in case of future audit	0.94	
The e-service may lead to a wrong payment that needs further correction	0.85	
I worry about conducting transactions online requiring personal financial information	0.88	
Using e-service leads to fewer interactions with people	0.83	

Table 4: Cross validation results

Sample split	Sample Size	X^2/df	GFI	CFI	NFI	RMSEA
Education						
Secondary school or lower	1066	4.88	0.89	0.92	0.94	0.073
Bachelor's degree or higher	1192	0.80	0.83	0.88	0.89	0.089
Frequency of use						
Daily	519	3.74	0.85	0.89	0.91	0.061
Few times a week	975	5.28	0.89	0.90	0.92	0.075
Less than or once a month	764	4.08	0.84	0.87	0.89	0.065
Use of service						
Less than 6 years	732	3.69	0. 81	0.85	0.87	0.048
6 - 10 years	775	4.26	0.83	0.86	0.89	0.077
More than 10 years	751	3.14	0.89	0.91	0.93	0.073