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Service quality and trust in e-government: Utilizing the rich measures of system usage to predict trustworthiness

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Abstract

What is the theoretical rationale that e-government evaluation should employ? Witnessing the changes in society and the public sector, an adaptation is proposed, to evaluate trust building as the goal of e-government, rather than looking for the best predictors of e-government adoption. Organisations that provide online services are concerned about the evaluation of service quality, user satisfaction, and the ultimate goal of the system – value creation. Considering trust as a major value that organisations wish to achieve, the impact of service quality on trust building is at the focus of this study: What are the system features that constitute trust in the organisation? To what extent would each feature explain trust building? In the context of e-government that serves the wide public it is of particular significance to scrutinize the nature of the relationships between the user and the system. Therefore, an adaptation is proposed, to evaluate trust building as the goal of system usage rather than its predictor, in a formative model. This theoretical rationale alters the conventional relationships between well-studied measures of service quality. In a modified version of ESQUAL, the service measures were turned into indicators of trust. The findings (n=395) support the viability of the model; the extent to which the user puts trust in the organisation depends on how trustworthy the system is. In addition, the findings support the conceptualization of richer measures of system usage as stronger indicators. Theoretical, methodological and practical implications are discussed.

Keywords: e-government; ESQUAL; service quality; system usage; trust; user satisfaction

1.0 Introduction

The evaluation criteria of information systems (IS) reflect the constantly changing relationship between the user and the system. The rise of service quality evaluation tools urged researchers to rigorously examine user satisfaction, mainly in order to predict acceptance and further usage. In the effort to predict the intention to use, and actual use, IS research has focused more on evaluating the interface between a person, usually a consumer, and the computer. A large variety of variables, among them usefulness, satisfaction, loyalty and trust, were modelled to explain the desired adoption, usage or consumption of certain systems and services. However, greater weight is given in recent years to a more democratic approach. E-government indices that are used for annual evaluations of national Internet websites provide reliable indicators to the interest in citizen-centric e-government.

The aspiration to build democratic trust via e-government is clearly distinguished from the motivation to design the best interface and assure high-quality services, responsive and reliable (Cenfetelli, Benbasat & Al-Natour, 2008). In this study, the variety of contact channels, effective interfaces with the government and other indicators of service quality are not the goal per se. The "ultimate objective of that interface" (Benbasat, 2010: 17-18) is to establish trustful relationships between the government and the citizens, which are fundamental to good governance.

In the context of e-government it is of particular significance to scrutinize the nature of the relationship between the user and the system; the citizen and the institution, the public and the governors. Thus the trustworthiness of the government agency that provides the service is at the focus of this study; rather than the service itself. Indeed, Avgerou et al. (2009: 137) indicates that there is less research regarding the "possible mismatch between people's belief that an ICT-mediated service is trustworthy and their view on the trustworthiness of the government agency that provides the service".

The study of the deep relationship between people and systems, beyond the actual usage, requires the differentiation between user satisfaction and system usage (Burton-jones & Straub, 2006). While user satisfaction is examined within the context of interactions, including the effect of past interactions on future ones, the study of system usage views the IT artefacts as social actors (Al-natour & Benbasat, 2009), thus study how interactions affect the beliefs users form about the artefact, and "about their bond or relationship with the IT artifact" (Al-Natour & Benbasat, 2009: 637).

Trust, in this study, represents one's confidence in the system; trust is the value that the system is supposed to create while providing on-line services.

Several studies term the trusted entity "trustee" and the trusting one "trustor" (Mayer et al., 1995; McKnight et al., 2002; Serva et al., 2005). A successful IS, therefore, is considered by users as adequately trustworthy to be used (Avgerou et al., 2009; Carter & Belanger, 2005; Fukuyama, 1995; Gefen, Karahanna, & Straub, 2003; McKnight, Choudhury, & Kacmar, 2002; Pavlou & Gefen, 2004; Salam, Iyer, Palvia, & Singh, 2005; Warkentin, Gefen, Pavlou, & Rose, 2002). In addition to these studies that integrate satisfaction and adoption with trustworthiness, other studies tried to integrate satisfaction and adoption with user acceptance models (McKinney, Yoon, & Zahedi, 2002; Pavlou & Fygenson, 2006; Wang, Zheng, Xu, Li, & Meng, 2008; Wareham, Zheng, & Straub, 2005; Wixom & Todd, 2005).

The successful user-IT interaction is a shared practice of trust building that consolidates the interrelationships between the agents, and therefore "motivates the anticipation of mutually recognized value" (Fuller, Warren, & Norman, 2011: 92). Theorized as a value-creating system, this trust-building mechanism helps to understand the nature of user-IT bonding. The value that the system is supposed to create, while providing on-line services, is trust. A successful IS, therefore, is considered by users as adequately trustworthy to be used (Avgerou et al., 2009; Carter & Belanger, 2005; Fukuyama, 1995; Gefen, Karahanna, & Straub, 2003; McKnight, Choudhury, & Kacmar, 2002; Pavlou & Gefen, 2004; Salam, Iyer, Palvia, & Singh, 2005; Warkentin, Gefen, Pavlou, & Rose, 2002)

Increasing trust in government through e-government is an outcome worth pursuing. What are the features that enable trust building? What factors constitute trust in the system, and thereafter assure trust in the organisation? Is it a feature of the website or a matter of user satisfaction that depends on user perceptions and varies with experience and confidence? To what extent would satisfying system usage contribute to the governmental trustworthiness? The impact of service quality on trust is at the focus of this study. The questions are further elaborated within a formative model, as proposed by Petter, Straub and Rai (2007).

2.0 Methodological background

A useful instrument that provides reliable measures of online service quality is ESQUAL (Parasuraman, Zeithaml, & Malhotra, 2005). ESQUAL is based on categories of website features that Zeithaml, Parasuraman & Malhotra (2002) identified, among them are reliability, responsiveness, access, flexibility, ease of navigation, efficiency, security/privacy, price knowledge, site aesthetics and customization/personalization (Zeithaml et al., 2002). Thus, while the website features encompass many aspects of trustworthiness, trust can only be implied. Similarly, trust is not explicitly included in ESQUAL's dimensions (Table 1).

Going back to the origins of ESQUAL, SERVQUAL (Parasuraman et al., 1985, 1988) does mention trust. One of the SERVQUAL dimensions is assurance, which refers to the ability of staff to inspire confidence and trust. Another dimension, termed empathy, also implies trust by the measurement of caring individualized service provision (Table 1). Yet, without theoretical grounding the role of SERVQUAL in trust evaluation is still limited.

ESQUAL (online services) (Parasuraman, Zeithaml, & Malhotra, 2005)	SERVQUAL (Parasuraman et al., 1985, 1988)
Efficiency, e.g. ease and speed of use; Fulfilment, e.g. delivery and item availability; System availability, e.g. technical functioning; Privacy, e.g. protecting user information.	Tangibles, e.g. physical facilities, equipment, staff appearance; Reliability, e.g. ability to perform service dependably and accurately Responsiveness, e.g. willingness to help and respond to customer need; Assurance, e.g. ability of staff to inspire confidence and trust; Empathy, e.g. providing caring individualized service.

Table 1. ESQUAL and SERVQUAL dimensions

Kettinger & Lee (1994) and Pitt, Watson, & Kavan (1995) were among the first to adopt SERVQUAL in IS research. Kettinger & Lee (1994) have utilized SERVQUAL to evaluate user satisfaction with the information service function. They conclude that SERVQUAL can not capture the detailed aspects of IS service quality. The validity of SERVQUAL was questioned also by van Dyke, Kappelman, & Prybutok (1997). Although Pitt, Watson & Kavan (1995) used the instrument, their study did not provide validity tests to address the criticism (Boudreau, Gefen & Straub, 2001).

Concerns were continually raised regarding the suitability of SERVQUAL to the IS context (Kettinger & Lee, 1997; Pitt et al., 1997; van Dyke et al., 1999). At the same time DeLone & McLean (1992, 2003) provided the essential building blocks for later models. The concept of services caught the attention of IS researchers. Ancarani (2005) argued that service quality should entail both content (the functionalities that the website offers) and delivery (how well these functionalities can be accessed) elements.

Similarly, system quality and information quality were evaluated separately and then composed together the user satisfaction model (Cenfetelli & Schwarz, 2010). System quality, defined as "a user's evaluation of the technical capabilities of the system and its usability", represents beliefs such as reliability, flexibility and responsiveness. Information quality, defined as "a user's evaluation of the system's conveyance of semantic meaning and/or communication of knowledge", represents beliefs such as accuracy, currency, and completeness (Cenfetelli & Schwarz, 2010: 4). Table 2 and Figure 1 summarize the complementary components of overall service quality evaluation.

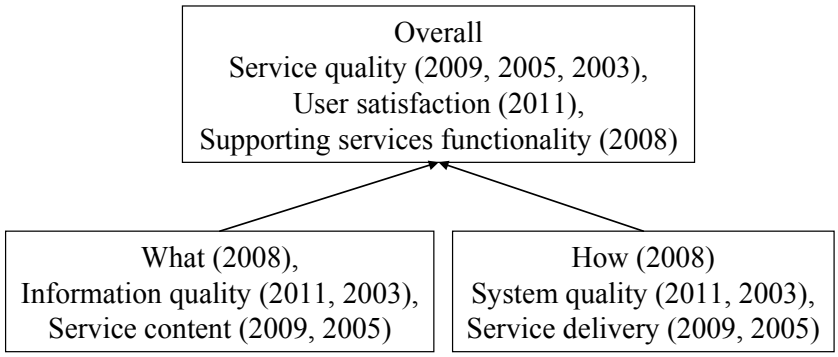

Figure 1. Service quality is formed of system and content evaluation

In the current study one construct is equivalent to the content (information quality). The other constructs are equivalent to the system. The questions are targeted either to the user (two constructs of user satisfaction) or to the system (four constructs of system trustworthiness) as presented in Figure 3.

Overall service evaluation	What to supply	How to supply
User satisfaction (Cenfetelli & Schwarz, 2011: 4)	Information quality, defined as "a user's evaluation of the system's conveyance of semantic meaning and/or communication of knowledge", represents beliefs such as accuracy, currency, and completeness	System quality, defined as "a user's evaluation of the technical capabilities of the system and its usability", represents beliefs such as reliability, flexibility and responsiveness
Service quality (Tan & Benbasat, 2009)	Service content	Service delivery
Supporting services functionality (SSF) (Cenfetelli, Benbasat & Al-Natour, 2008)	How supporting services should be provided (e.g., responsively and reliably)	What those services are (e.g., product recommendations)
Service quality (Ancarani, 2005)	Service-content quality would measure the functionalities that the website offers	Service-delivery quality would measure how well these functionalities can be accessed
Service quality measures the overall support (DeLone & McLean, 2003)	Information quality measures semantic success, i.e. conveying the intended meaning	System quality measures technical success, i.e. the accuracy and efficiency of the communication system

Table 2. IS research: System and content are complementary in service quality evaluation

To address the main research question, what makes a system trustworthy, the impact of the website on the user's trust in the organisation is examined.

The following section refines several distinctions between measurement models.

2.1 Terminology: formative and reflective models

The terms used throughout the following sections of the paper are consistent with the terminology specified by Petter, Straub & Rai (2007). Primarily the terms formative and reflective pinpoint the important differences between measurement models. In their work, Petter, Straub & Rai (2007) discuss the misspecifications of formative and reflective constructs.

A reflective construct is an "underlying latent, unobservable construct" (Petter, Straub & Rai, 2007: 624) that affects other constructs. The affected constructs are the indicators that provide observed measures of the reflective construct. Thus, the model is unidimensional and "individual measures can be removed to improve construct validity without affecting content validity" (Petter, Straub & Rai, 2007: 626). While the reflective construct "causes" the indicators (and the indicators reflect that

influence), the formative construct is formed by them. Each formative indicator forms different aspects of the studied phenomenon, thus the model is multidimensional. The indicators are complementary constructs that should not be removed, and should not be highly correlated with each other.

Literature reviews revealed the tendency to "miscategorize formative constructs as reflective rather than improperly specifying reflective constructs as formative" (Petter, Straub & Rai, 2007: 624). Although the problem was observed in the marketing literature (Jarvis et al. 2003) IS researchers may also fail and misspecify reflective and formative constructs (Chin 1998; Petter, Straub & Rai, 2007).

3.0 Research model and questions

In the first phase, the EPSQUAL model is adopted as is (Figure 2) in order to identify the contribution of each EPSQUAL factor. After reviewing the evaluation factors of service quality and IS success, as were originated and evolved in the marketing and IS literature, assuring the reliability of EPSQUAL would enable further development.

In the second phase, the EPSQUAL model is altered according to a theoretical rational (Figure 3). The goal is to propose a formative model of trust building, with the factors of service quality as its indicators.

Increasing trust in government through e-government is an outcome worth pursuing. Recent studies demonstrate the contribution of e-government to the agencies' credibility (Huang & Brooks, 2011) and to decreased corruption (Andersen, 2009; Bertot, Jaeger & Grimes, 2010; Cho & Choi, 2004). Witnessing the technological changes in society and the public sector, an adaptation is proposed, to evaluate trust building as the ultimate goal of system usage; to construct the trustworthiness of the governmental authority that provides the service rather than the service itself. The proposed model consists of the trustworthiness of the governmental authority as a formative construct; and the evaluation factors of service quality as complementary indicators (Petter, Straub & Rai, 2007).

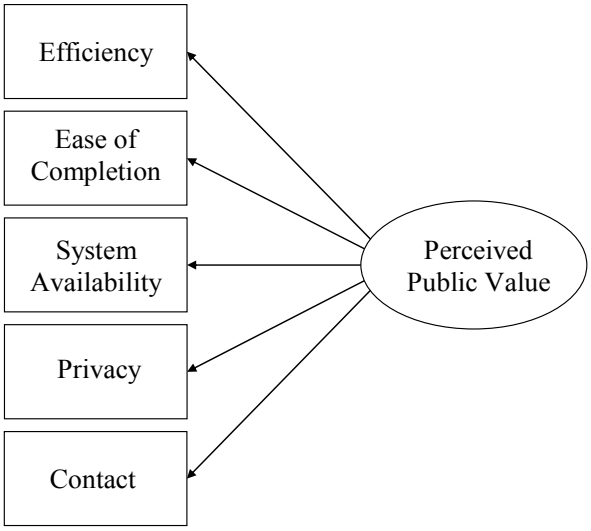

Figure 2. The reflective model of EPSQUAL

EPSQUAL's factors (Connolly et al., 2010)

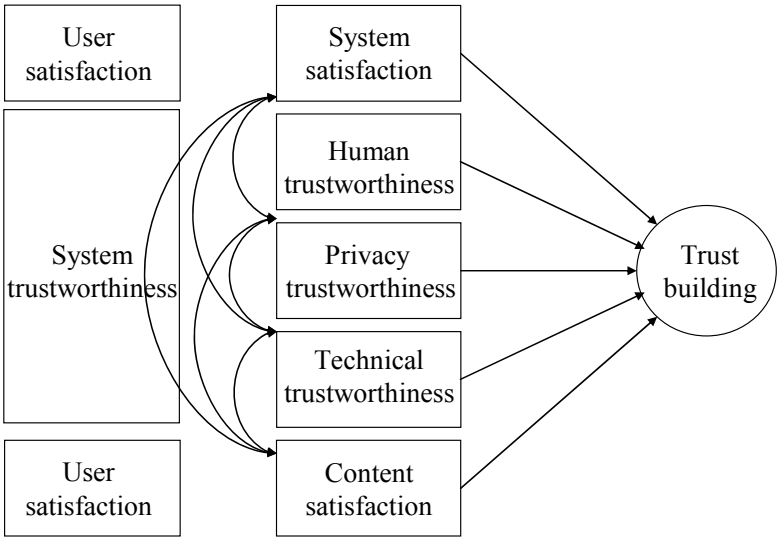

Figure 3. The formative model of trust building

Trust building and the indicators

The third phase draws on the conceptualization of system usage as proposed by Burton-Jones & Straub (2006). Each factor is examined according to the domains it measures: the system (is easy to use; loads fast); the user (I am likely to…); and/or the task (pay, complete, file). The contribution of the factors is expected to align with their richness levels, i.e. the domains they measure. System usage is key indicator – richer than factors of user satisfaction – and the richer measures of system usage are

stronger indicators. Accordingly, the factors were renamed in order to emphasize their measured domain (Figure 3): satisfaction factors measure the user domain; and trustworthiness factors measure the system and/or the task domain(s).

This examination addresses a methodological need in IS research, to assess the contribution of rich measurement in system usage evaluation. It is expected to reveal that system usage is key to trust building.

4.0 Methodology

The study is carried out through the following phases: (1) to assess the reliability and the validity of EPSQUAL in a replication study; (2) to understand the changes in constructs composition that Connolly et al. (2010) proposed based on statistical analysis; (3) to analyze the current survey results according to a theoretical rationale; and (4) to propose a rationale that aligns with both marketing and IS dimensions.

4.1 The questionnaire

Since SERVQUAL was originated and evolved in marketing research, its validity was challenged when introduced to the field of IS (Boudreau, Gefen & Straub, 2001). The validity of SERVQUAL is indeed in question; and experience tells that a theoretical rationale and a rigorous methodology are crucial to avoid controversies regarding its validity to IS. However, SERVQUAL as well as ESQUAL still provide a highly reliable measure of service quality that could be useful for IS research.

ESQUAL is based on SERVQUAL (Parasuraman et al., 1985, 1988) that compares organisational performance with customers' perceptions regarding the importance of different service attributes. SERVQUAL was used also to measure online services. However, adjustment to the online environment was needed and ESQUAL was developed.

A new version of ESQUAL, termed E-Public Sector QUAL (EPSQUAL), was modified and adapted to the IS field by Connolly et al. (2010). Being a modified version of the ESQUAL instrument (Parasuraman, Zeithaml, & Berry, 1985, 1988, 1991), EPSQUAL is based on service measures that were developed in the marketing literature according to rationales and concepts of that field. EPSQUAL is therefore a promising tool that carries the burden of proof.

EPSQUAL was carried out to examine the Irish government's online tax filing system - the Revenue Online Services (ROS). The ROS emailed the questionnaire in November 2007 to 22,000 citizens who file their tax returns online. A total of 6,661 participants, including tax practitioners who use the system, filled the questionnaire.

Based on the survey results, Connolly et al. (2010) introduced several changes. Two additional constructs represented perceived value (user's costs and benefits trade-off); and loyalty intentions (Zeithaml, Berry & Parasuraman, 1996). Another subscale measured non-routine problems with 11 items in three dimensions: responsiveness (handling problems effectively), compensation (of customers for online problems), and contact (availability of human assistance). Further modifications were made in order to fit the public sector requirements (Appendix 1).

Thus, Connolly et al. (2010) provide an instrument that was developed and modified in a rigorous empirical process, based on a thorough review of the scales and instruments used to measure online service quality.

However, little attention was given by Connolly et al. (2010) to theoretical justification. The items were chosen in the same manner that was criticized by Burton-Jones & Straub (2006: 231), i.e. for their "appearance in past empirical studies rather than for theoretical reasons". After collecting the data, Connolly et al. (2010) factor-analyzed them and created six factors. Statistical analysis guided the decisions to merge, split, or remove factors and variables. Reliability measures established the new constructs (Table 3), although theoretical rationale could approve different dimensions.

A related limitation is the reliance on marketing instruments and studies. Little attention was given by Connolly et al. (2010) to the IS literature and instruments while building and assessing the modified tool.

The limitations are expected to be resolved in this study. While EPSQUAL (Figure 2) was developed based on empirical results (Connolly et al., 2010), in this study the dimensions of EPSQUAL are reorganised and renamed (Figure 3).

The new EPSQUAL instrument includes 35 question items, measured on a Likert scale. The new arrangement of question items into factors, as proposed by Connolly et al. (2010) following data analysis, is presented in Appendix 1. The questionnaire was translated to Hebrew and validated (Appendix 1).

4.2 The respondents

To execute the survey, a municipal website contained in its homepage an HTML link that directed citizens to an online questionnaire, inviting their participation. The city, Haifa, is the third-largest in Israel, with a population of over 250,000 including 10% Arabs; of the remaining 90% Jews, one in four has immigrated to Israel from the former Soviet Union. Being the largest city in northern Israel, with high-tech parks and universities, Haifa is a major regional centre. The municipality of Haifa collects 12% of municipal payments online; above the national average of 8%. Israel is a member of the OECD, a developed economy that pioneers in high-tech industries. International financial indices list the local stock exchange as a developed market. According to the United Nations E-Government Survey 2012 Israel is ranked 16th in the world's E-Government Development Index and 7th in the E–Participation Index (UNPAN, 2012). This is to say that the findings are expected to be generalizeable to developed countries.

5.0 Results

A total of 395 citizens (49% females) filled the questionnaire during September-October 2011. The age distribution of respondents is showed in Figure 4.

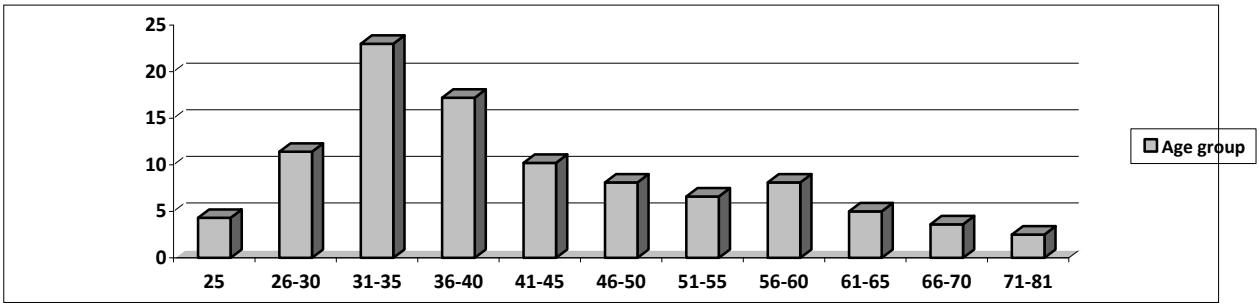

Figure 4. Age distribution of the 395 respondents

In the case of EPSQUAL, Connolly et al. (2010) defined the construct Perceived Public Value as the dependent variable and the other constructs as the independent variables. According to that model the independent variables should explain or predict the dependent variable; i.e. EPSQUAL is defined as a formative model. According to

the results in both studies, the relationships between the constructs raise the possibility of a reflective model.

5.1 The reflective EPSQUAL model

After ensuring the reliability levels (table 3), regression analyses were carried out and revealed very strong connections between the factors. The strong connections indicated that not all EPSQUAL's factors are needed. The fact that none of them is specifically needed to construct a theoretical argument supports that conclusion.

Construct	Number of question items	Cronbach's alpha	
		Connolly et al. (2010)[a] (n=6131-6514)	Current study (n=395)
Efficiency	8	0.89	0.93
Ease of Completion	3	0.86	0.91
System Availability	4	0.85	0.92
Privacy	2	0.85	r = 0.84[b]
Contact	3	0.85	0.91
Perceived Public Value (Combined perceived value, loyalty intentions and website service quality items)	13	0.96	0.97

Table 3. Reliability analysis of the same question items

[a] Connolly et al. (2010: 654-655) Tables 4 and 6

[b] The reliability of two items is measured as r.

5.1.1 EPSQUAL factors – Stepwise regression

A multiple correlation assesses the connection between the independent factors, organised in a linear combination, and the dependent variable (Perceived Public Value). The analysis revealed a high correlation of r=0.88. However, examining the extent to which each factor contributed to the connection, an unequal proportion is revealed.

In stepwise technique the number of predictors is determined statistically and not according to the researcher's hypothesis:

1. The leading factor, Efficiency, already explains more than necessary with a correlation of r=0.87. The high overlap between Efficiency and the dependent variable could raise concerns regarding its validity; apparently Efficiency is not a good measure of the dependent variable.
2. Only two additional variables are included in the model, as opposed to five factors in Connolly et al. (2010); each contributes only one additional percent of the variance.

In the desired formative model each of the predictors should explain 20-30 percent of the variance. The formative indicators (independent variables) are expected to explain different aspects of the multidimensional model; to provide distinctive and complementary value. Indeed, Connolly et al. (2010) reviewed the development of the instrument as a multidimensional model that includes different dimensions. However, the survey results do not satisfy formative expectations.

The results follow the predictable pattern of reflective measures: the reliability levels are high; and the redundant indicators may indicate a unidimensional model. The omission of measures to improve construct validity is in fact possible and harmless in regard to the content validity (Petter, Straub & Rai, 2007).

A reflective construct is an "underlying latent, unobservable construct" (Petter, Straub & Rai, 2007: 624) that affects other constructs. The affected constructs are the indicators that provide observed measures of the reflective construct. Thus, the model is unidimensional, and therefore "individual measures can be removed to improve construct validity without affecting content validity" (Petter, Straub & Rai, 2007: 626).

While the reflective construct "causes" the indicators (and the indicators reflect that influence), the formative construct is formed by them. Each formative indicator forms different aspects of the studied phenomenon, thus the model is multidimensional. The indicators are complementary constructs that should not be removed, and should not be highly correlated with each other.

It is reasonable to assume that EPSQUAL is a reflective model. A theory is needed to support the rationale that various measures of service quality are the reflection of Perceived Public Value. In the absence of explicit theoretical prediction the question remains open.

In summary, the stepwise method computed only three factors in the regression model, just to provide a limited contribution of r2=0.761, r2=0.771, and r2=0.775. The large sample, almost 400 participants, probably assured the significance. Following the results, a different technique was applied.

5.1.2 EPSQUAL factors – Enter regression

Enter regression, where all factors are entered to the model, showed the same results: similar percent of the explained variance; and Efficiency as the strongest factor in the model (beta = 0.722; beta represents the prediction power of each construct; the

coefficient). The other predictors lag behind with much smaller betas, some are not significant (Privacy was not significant; System Availability was almost not significant).

Although Efficiency is correlated with other factors, e.g. with Ease of Completion or with System Availability, it is essential for the model to be significant. Any change in the predicting side of the model is expected to affect the standard scores of the dependent variable. Without Efficiency the explained variance is not satisfying.

In summary, based on the regression results, there is no need for five factors to explain the dependent variable as proposed by Connolly et al. (2010).

5.2 The Trust formative model

Except for Efficiency, the results of the present study are mostly consistent with those of Connolly et al. (2010). And yet, the factors are labelled differently (Table 4). This is done in order to distinguish the following dimensions:

User vs. system: The formative model (Figure 3) consists of two constructs of user satisfaction (e.g. I am likely to); and three constructs of system trustworthiness (is easy to use; loads fast).

What vs. how: In accordance with IS concepts, a distinction is made in the current study also between content (the construct Content Satisfaction) and system quality (Table 2 and Figure 1).

The new factors are compared to those of Connolly et al. (2010) in Table 4. The question items that compose Efficiency in Connolly's et al. (2010) study are distributed, in this study, across factors: five items in System Satisfaction, two items in Technical Trustworthiness, and one item in Content Satisfaction. Therefore Efficiency is presented in a separate column in Table 4.

Current study	EPSQUAL factors	
System Satisfaction 17 items	Perceived Public Value dependent variable 12 items	Efficiency 5 items
Technical Trustworthiness Privacy Trustworthiness 8 items	System Availability Privacy All 6 factors' items	Efficiency 2 items
Content Satisfaction 5 items	Ease of Completion All 3 factor's items	Efficiency 1 item
Human Trustworthiness 3 items	Contact All 3 factor's items	– –
Formative construct: Trust 5 items	Removed All 5 removed items	– –

Table 4. Constructs comparison

Tables 5-8 present the new constructs, their alpha values, and the related question items ordered according to their loadings.

Current study System Satisfaction: 17 items (α value = 0.98)	EPSQUAL constructs
Q35 I am likely to recommend ROS to someone who seeks my advice. Q37 I am likely to consider ROS as my first choice for future transactions with Revenue. Q32 The extent to which ROS gives you a feeling of being in control. Q31 The overall convenience of using ROS. Q34 I am likely to say positive things about ROS to other people. Q36 I am likely to encourage friends and others to use ROS.	Originally the items of Loyalty Intentions construct; merged to form Perceived Public Value in EPSQUAL
Q1 ROS makes it easy to find what I need. Q33 The overall value you get from ROS for your effort. Q2 ROS makes it easy to get anywhere on the site. Q11 ROS is well organised. Q9 ROS is easy to use.	Efficiency (1, 2, 7, 9, 11) and an item of Perceived Value construct (easy to get anywhere on the site)
Q13 On the whole, I am satisfied with the service quality of this website Q30 In terms of service quality, this website is very satisfactory. Q19 I find the service quality of this website to be very satisfactory. Q23 I would describe the service quality of this website as very satisfactory.	Originally the items of Website Service Quality construct; merged to form Perceived Public Value
Low connection to this factor: Q38 I am likely to use ROS from now on for filing my tax returns. Moved from factor 4: Q7 ROS has comprehensive FAQs.	Originally of Loyalty Intentions; merged to form Perceived Public Value Efficiency added

Table 5. System Satisfaction

Current study Technical Trustfulness: 8 items (α value = 0.92)	EPSQUAL constructs
Q16 This site does not crash. Q15 This site launches and runs right away. Q14 ROS is always available for business. Q17 Pages at this site do not freeze after I sign and submit.	All System Availability items (Q14-Q17)
Q6 ROS loads its pages fast. Q10 This website enables me to get on to it quickly.	Two Efficiency items (6, Q10)
Privacy Trustworthiness Q21 ROS protects information about my tax returns. Q20 It does not share my personal information with other sites.	All Privacy items (Q20-Q21)

Table 6. Technical Trustworthiness

It should be noted that statistically the privacy questions are related to the same factor as trustworthiness of the system; and yet, recognizing the impact of privacy concerns on users, both questions are considered to form a distinct Privacy construct.

Current study Content Satisfaction: 5 items (α value = 0.90)	EPSQUAL constructs
Q5 ROS enables me to pay my tax easily. Q3 ROS enables me to complete my tax returns easily. Q4 ROS enables me to file my tax returns quickly.	All Ease of completion items (Q3-Q5)
Q8 ROS has useful online demonstrations.	Efficiency (Q8)
Low connection to this factor: Q39 I am likely to use ROS from now on for payments.	Item added by ROS (one in Perceived Public Value)

Table 7. Content Satisfaction

Current study Human Trustfulness: 3 items (α value = 0.90)	EPSQUAL construct
Q26 ROS provides a telephone number for problems. Q27 This site has customer service representatives available online. Q28 It offers the ability to speak to a live person if there is a problem.	All Contact items (Q26-28)

Table 8. Human Trustworthiness

The items that were removed by Connolly et al. (2010) form the formative construct (dependent variable) in this study as presented in Table 9. The dependent variable, trust building, introduces a third agent; in addition to the user and the system, the user is asked to evaluate the impact of the system on one's trust in the municipality.

Current study Trust Building: 6 items (removed from EPSQUAL)
Q12 The ease of use of this website increases my trust in the ROS.
Q18 The reliability of this website (e.g., it never crashes or freezes) increases my trust in ROS.
Q22 Knowing that the privacy of my personal information is protected on ROS increases my trust in the ROS.
Q24 If when filing my tax returns there are any problems, the system highlights them clearly.
Q25 ROS takes care of problems promptly.
Q29 Knowing that this website provides contact details increases my trust in ROS.

Table 9. Formative construct: Trust Building (α value = 0.96)

5.2.1 Trust building model – Stepwise regression

Stepwise regression shows the significant impact of the indicators on Trust Building (Table 10; similar results in both studies). The indicators are ordered according to their contribution to the model: System Satisfaction, Human Trustworthiness, Privacy Trustworthiness, and Technical Trustworthiness (under Stepwise method, Content Satisfaction was not selected). As mentioned above, the Privacy factor is statistically related to the Technical Trustworthiness, and yet is analyzed as a distinct factor in order to examine the impact of privacy concerns on trust building. The results justify the decision, as presented also in Table 10. Privacy contributes a significant portion of the explained variance.

Model	R square	R square change	Adjusted R square; df1	Std error of estimate;df2	Sig. F change	F change	df1	df2
System Satisfaction	0.697	.835(a)	0.696	0.57131	0.697	1	393	0
Human Trustworthiness	0.765	.875(b)	0.764	0.50381	0.068	1	392	0
Privacy Trustworthiness	0.805	.897(c)	0.804	0.45914	0.04	1	391	0
Technical Trustworthiness	0.809	.899(d)	0.807	0.4554	0.004	1	390	0.007

Table 10. Stepwise regression – Trust building

5.2.2 Trust building model – ANOVA test

The ANOVA test shows the different impact of each factor on Trust building (Table 11). Consistent with the regression results, System Satisfaction is the strongest indicator; followed by Human Trustworthiness, Privacy Trustworthiness, and Technical Trustworthiness, in decreasing order.

Model		Sum of squares	df	Mean square	F	Sig.
System Satisfaction	Regression	294.683	1	294.683	902.853	.000(a)
	Residual	128.271	393	0.326		
Human Trustworthiness	Regression	323.457	2	161.728	637.178	.000(b)
	Residual	99.497	392	0.254		
Privacy Trustworthiness	Regression	340.527	3	113.509	538.439	.000(c)
	Residual	82.427	391	0.211		
Technical Trustworthiness	Regression	342.071	4	85.518	412.346	.000(d)
	Residual	80.883	390	0.207		

Table 11. ANOVA test – Trust building

5.2.3 Trust building model – Coefficients

Finally, Table 12 presents the coefficient values. The factor System Satisfaction receives the highest coefficient; the number of items (17) and their possible redundancy can explain that result. The following factors are: Human Trustworthiness, Privacy Trustworthiness, and Technical Trustworthiness.

Model		Beta (standardized coefficients)	t (zero-order)	Sig. partial	Sig. part	Correlations B	Correlations std. error
System Satisfaction	(Constant)		6.710	.000			
	System Satisfaction	.835	30.048	.000	.835	.835	.835
Plus Human Trustworthiness	(Constant)		3.480	.001			
	System Satisfaction	.586	17.282	.000	.835	.658	.423
	Human Trustworthiness	.361	10.647	.000	.765	.474	.261
Plus Privacy Trustworthiness	(Constant)		-.293	.770			
	System Satisfaction	.476	14.366	.000	.835	.588	.321
	Human Trustworthiness	.292	9.162	.000	.765	.420	.205
	Privacy	.260	8.999	.000	.710	.414	.201
Plus Technical Trustworthiness	(Constant)		-1.467	.143			
	System Satisfaction	.455	13.466	.000	.835	.563	.298
	Human Trustworthiness	.276	8.610	.000	.765	.400	.191
	Privacy	.226	7.224	.000	.710	.344	.160
	Technical Trustworthiness	.086	2.728	.007	.666	.137	.060

Table 12. Coefficients – Trust building

5.3 Proxies to system usage, tasks, and the user

This study aims to model trust building through the provision of successful online services. System usage is therefore a critical component in the evaluation process. Burton-Jones & Straub (2006: 232-4) introduced the rich measures of system usage that incorporate the entire studied activity. As opposed to rich measures, lean measures are confined to the extent of usage, or its duration, and do not capture the nature of the usage activity.

The rich measures evolve from the breadth of use, e.g. number of features (system); the extent to which the user employs the system (system and user); or the extent to which the system is used to carry out the task (system and task); and finally the extent to which the user employs the system to carry out the task (system, user, and task), which is more difficult to capture.

The challenge of capturing all three elements of usage in a single measure is resolved with the suggestion "to combine measures for the system, user, and task aspects of usage and create an aggregate higher-order construct to capture the entire activity" (Burton-jones & Straub, 2006: 232). In this study the richness level of each construct was determined by its variables: whether focused on the system (is easy to use; loads fast), the user (I am likely to…), and/or the task (pay; complete; file).

Another difficulty is the validity of existing usage instruments. The suggestion to define and select measures conflicts with the possibility that the existing usage measures are invalid. Indeed, Burton-Jones & Straub (2006: 233) claim that "past studies offered no detailed definition and conceptualization of usage from which to build valid measures […].Even so, we believe that some usage measures in past research, and even some measures that were not explicitly created to measure usage, can serve as valid usage measures".

Assuming the validity of the factors, they are ordered according to their predictive contribution (Figure 3). Usage Frequency, the lean measure that indeed has the lowest connection with trust building, is not included in Figure 3.

Table 13 presents the constructs ordered according to their richness levels, from the lean to the richer measures; and compared to the correlations with the formative construct, Trust building, that incorporates system, user, and task.

Domain of content measured	Examples	Constructs	Pearson Correlation	Sig. (2-tailed)
Omnibus: Extent of use (lean)	E.g. the user uses the site more than once a day/ week/ etc.	Usage Frequency	.108*	0.031
System: Extent to which the system is used	E.g. the site launches quickly, loads pages and runs fast, always available, and does not crash or freeze.	Technical Trustworthiness	.666**	0.009
System and task: Extent to which the system is used to carry out the task	E.g. the site enables payments and transactions, completing forms, filing documents, and watching useful demonstrations.	Content Satisfaction (did not enter the model)	.682**	0
System and user: Extent to which the user employs the system	E.g. the site protects information about my business and does not share my personal information with other sites.	Privacy Trustworthiness	.710**	0.031
System, user, and task: Extent to which the user employs the system to carry out the task	Human trust: E.g. the site provides access to the workers at the municipality to solve problems, and the continuous availability of online representatives.	Human Trustworthiness	.765**	0
	System sat: E.g. the user's intention to recommend and to use, the ease of use, usefulness, sense of control, and satisfaction of SQ.	System Satisfaction	.835**	0

Table 13. System usage: user satisfaction and system trustworthiness

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Table 13 shows how useful are the rich measures that align with the regression results (System Satisfaction is the strongest indicator, followed by Human Trustworthiness, Privacy Trustworthiness, and Technical Trustworthiness). Content Satisfaction, that measures user satisfaction as per specific tasks, was filtered out of the regression model. This result is also expected according to the rationale of rich measures.

The richness level of each factor is assumed to be consistent with its correlation with the dependent variable, Trust building. Indeed, the lean measure Usage Frequency has the lowest correlation with Trust building. Although common in surveys and

omnibus, frequency of use (e.g. more than once a day/week/month etc.) is also a lean measure that represents only the occurrence of usage.

The Technical Trustworthiness factor is expected to measure the system itself. The factor includes question items about technical aspects, e.g. the site launches quickly, loads pages and runs fast, always available, and does not crash or freeze. Such items may indicate the extent to which the system is used.

The Content Satisfaction factor that appeared to be a weak predictor of Trust building (was not selected in the Stepwise technique) reflects the variety of tasks: payments and transactions, completing forms, filing documents, and watching useful demonstrations. The variety of tasks that the website enables is often the ultimate goal of managers in the organisation. While it probably can save time and money for the municipality and the citizens, the results so far do not provide a strong evidence for its contribution to trust building.

The following constructs are expected to contribute much more to the municipality's trustworthiness.

The Privacy factor is expected to measure the system and the user, and as such it is considered a rich measure. Two question items allow the factor to achieve a rich measure of system use; the extent to which the system protects information about my business and does not share my personal information with other sites.

Privacy could be statistically included (factor-analyzed) in the Technical Trustworthiness factor. The decision to form a distinct Privacy factor receives empirical support; as Privacy contributes a significant portion of the explained variance in the model (Table 10). More interesting, the assumed connection between Privacy and Trust building is verified by its consistently higher values compared to the Technical Trustworthiness factor.

Domain of content measured	Examples	Constructs	Pearson Correlation	Sig. (2-tailed)
Omnibus: Extent of use (lean)	E.g. the user uses the site more than once a day/ week/ etc.	Usage Frequency	.108*	0.031
System: Extent to which the system is used	E.g. the site launches quickly, loads pages and runs fast, always available, and does not crash or freeze.	Technical Trustworthiness	.666**	0.009
System and task: Extent to which the system is used to carry out the task	E.g. the site enables payments and transactions, completing forms, filing documents, and watching useful demonstrations.	Content Satisfaction (did not enter the model)	.682**	0
System and user: Extent to which the user employs the system	E.g. the site protects information about my business and does not share my personal information with other sites.	Privacy Trustworthiness	.710**	0.031
System, user, and task: Extent to which the user employs the system to carry out the task	Human trust: E.g. the site provides access to the workers at the municipality to solve problems, and the continuous availability of online representatives.	Human Trustworthiness	.765**	0
	System sat: E.g. the user's intention to recommend and to use, the ease of use, usefulness, sense of control, and satisfaction of SQ.	System Satisfaction	.835**	0

Table 14. System usage: user satisfaction and system trustworthiness

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

A very-rich measure is claimed to be "difficult to capture via a reflective construct" (Burton-Jones & Straub, 2006: 233). The construct Human Trustworthiness examines the availability of human response. Three question items evaluate to what extent the system provides access to the workers at the municipality to solve problems, and the continuous availability of online representatives. The ability to access the organisation and contact workers in person, not only by automated interfaces, appears to be a valuable aspect of the system. Therefore, organisations that aim to enhance user trust could benefit from a reliable help desk and an effective group of workers that is designated to address users' problems and solve them quickly.

The very-rich measure System Satisfaction includes question items about the intention to recommend and to use, sense of control, ease of use, usefulness, and satisfaction of SQ. Its strong connection with the dependent variable Trust building may indicate a possible redundancy in the EPSQUAL model. The phenomenon in which two or more predictors in a multiple regression analysis are highly correlated is called multicollinearity. As a rule of thumb, multicollinearity is not recommended. However, in the current study Trust is not a predictor, it is the dependent variable, therefore the statistical risk of multicollinearity does not threaten the model. Moreover, when further analyzing of the predictive values of each predictor – as presented in Tables 9-10 with statistical tests – it can be seen that each individual predictor has its unique contribution to the model; except for the factor Content Satisfaction (EPSQUAL's Ease of Completion).

5.4 Summary of findings

First, a replication study of EPSQUAL showed similar results:

1. High reliability (alpha values) when arranging the question items according to the EPSQUAL factors;
2. Strong associations between the factors, which may indicate redundancy;
3. The same few variables showed multiple loadings across the factors.

While Connolly et al. (2010) removed these few apparently-unrelated variables based on the empirical results, in the current study the same variables form the explaining construct: Trust building.

Next, factor-analyzing the question items of the current study yielded similar results as those of Connolly et al. (2010). In the effort to provide a conceptual contribution, beyond the empirical one, new labels were given to the factors. Statistical tests revealed the predictive power of each factor: System Satisfaction (EPSQUAL's Perceived Public Contact), Human Trustworthiness (EPSQUAL's Contact), Privacy (although statistically related to EPSQUAL's Technical Trustworthiness, two questions about privacy concerns compose a distinct factor; the distinctive results support this decision) and Technical Trustworthiness (EPSQUAL's System Availability). Content Satisfaction (EPSQUAL's Ease of Completion) was not selected in a regression model. Perhaps it should be mentioned again that the richness

of each factor, i.e. the domains it measures – system, user, and/or task – aligns with the predictive contribution of the factor in the regression model.

6.0 Implications

The findings highlight the richness of measures as a useful perspective of website evaluation: from the lean measure frequency; through rich measures such as ease of use; to the very-rich measures Human Trustworthiness, System Satisfaction, and Trust. Thus, when analyzing survey data and trying to understand the users and the systems – the differentiation of system usage and the user is key.

Content Satisfaction: If trust building is the main goal of the website, a variety of services may not have the desired contribution. Service supply on the Internet probably saves time and money for the municipality and the citizens, but its relative contribution to the municipality's trustworthiness appears low, compared to the other predictors that were examined.

Privacy and Technical Trustworthiness: Privacy concerns impact the municipality's trustworthiness more than the number of online services, and more than the technical stability of the system. The practical implication is that protecting business and personal information would be beneficial for trust building. Theoretical implications would refer to the ethical role of governmental institutions in the society.

Human Trustworthiness: Having the option of human response in addition to the automated interface is a valuable aspect of the system. The availability of online representatives, as well as access to workers at the municipality to solve problems would obtain the required contact. Theoretically, this finding is intriguing for further research regarding user differences. Is it only an age difference between native users and their ancestors or a deeper requirement for the availability of human contact in case of trouble?

The practical implication is that a reliable help desk, and a group of effective workers, should be designated to solve problems quickly.

System Satisfaction: the user's intention to recommend and to use the system; the user's perceptions of the system's usefulness and ease of use; as well as the user's sense of control and satisfaction, are all highly correlated with each other and with the formative construct, Trust building. The strong connections imply a possible redundancy of that measure.

Usage Frequency: although common in user surveys, Usage Frequency is a lean measure that gains the lowest correlation with Trust building. Frequency of use, e.g. more than once a day/week/month etc., reflects only the occurrence of usage.

The number of domains that each factor measures – system, user, and/or task – aligns with the predictive contribution of the factors in the regression model. This finding supports the conceptualization of system usage (Burton-Jones & Straub, 2006) and emphasizes the need in a theoretical prediction.

7.0 Discussion

This study addresses theoretical, methodological, and practical questions about trust building. The main research question is: What would be the characteristics of a website that enhance trust building? In the current context of e-government it is of particular significance to scrutinize the nature of the relationship between the user and the system.

The results reveal a clear picture (Figure 3 and Table 13). Providing human response to solve users' problems, protecting users' information, and stabilizing the Internet website technically are among the main factors that shape the users' perspective on the organisation. The study applies a formative model in which trust building depends on the (system) trustworthiness and the (user) satisfaction.

The findings highlight the usefulness of richer measures, i.e. measures that integrate different aspects of usage, versus lean measures. Constructs that capture more dimensions of system usage (system, user and/or task) tend to obtain better predictions. This conceptualization, proposed by Burton-Jones & Straub (2006), is consistent with the regression model. Hence the study contributes to our understanding how to operationalize the concept of system usage.

Being theoretical constructs, the factors are supposed to assess a theoretical model rather than to be determined by statistics. The theoretical rationale made it possible to recognize the essential role of a group of variables that form the explained construct in this study. Trust building, a very-rich measure of system usage, is connected to the other factors; as expected in a formative model.

Similarly, Privacy could be statistically included (factor-analyzed) in the Technical Trustworthiness factor. The decision to form a distinct Privacy factor received empirical support: Privacy contributes a significant portion of the explained variance

in the model (Table 10); and the assumed connection between Privacy and Trust Building is verified by its consistently higher values compared to the Technical Trustworthiness factor.

It would be worthwhile to further explore the factors that establish trustful relationships between the user, the system, and the organisation (Benbasat, 2010). How can the interface act as a value-creating system (Fuller, Warren & Norman, 2011), trust-building mechanism (Avgerou et al. 2009). Increasing trust in government through e-government is a goal worth pursuing.

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Appendix 1

EPSQUAL Constructs and question items (Connolly et al., 2010: 655 Table 5).

Note: The factor Perceived Public Value combines the items of Perceived Value, Loyalty Intentions and Website Service Quality

Efficiency

Q1 ROS makes it easy to find what I need.

Q2 ROS makes it easy to get anywhere on the site.

Q6 ROS loads its pages fast.

Q7 ROS has comprehensive FAQs.

Q8 ROS has useful online demonstrations.

Q9 ROS is easy to use.

Q10 This website enables me to get on to it quickly.

Q11 ROS is well organised.

Ease of Completion

Q3 ROS enables me to complete my tax returns easily.

Q4 ROS enables me to file my tax returns quickly.

Q5 ROS enables me to pay my tax easily.

System Availability

Q14 ROS is always available for business.

Q15 This site launches and runs right away.

Q16 This site does not crash.

Q17 Pages at this site do not freeze after I sign and submit.

Privacy

Q20 It does not share my personal information with other sites.

Q21 ROS protects information about my tax returns.

Contact

Q26 ROS provides a telephone number for problems.

Q27 This site has customer service representatives available online.

Q28 It offers the ability to speak to a live person if there is a problem.

Perceived Public Value

Q13 On the whole, I am satisfied with the service quality of this website

Q19 I find the service quality of this website to be very satisfactory.

Q23 I would describe the service quality of this website as very satisfactory.

Q30 In terms of service quality, this website is very satisfactory.

Q31 The overall convenience of using ROS.

Q32 The extent to which ROS gives you a feeling of being in control.

Q33 The overall value you get from ROS for your effort.

Q34 I am likely to say positive things about ROS to other people.

Q35 I am likely to recommend ROS to someone who seeks my advice.

Q36 I am likely to encourage friends and others to use ROS.

Q37 I am likely to consider ROS as my first choice for future transactions with Revenue.

Q38 I am likely to use ROS from now on for filing my tax returns.

Q39 I am likely to use ROS from now on for payments.

Items left out by Connolly et al. (2010)

Q12 The ease of use of this website increases my trust in the ROS.

Q18 The reliability of this website (e.g., it never crashes or freezes) increases my trust in ROS.

Q22 Knowing that the privacy of my personal information is protected on ROS increases my trust in the ROS.

Q24 If when filing my tax returns there are any problems, the system highlights them clearly.

Q25 ROS takes care of problems promptly.

Q29 Knowing that this website provides contact details increases my trust in ROS.

Appendix 2

New constructs and Cronbach's alpha of present study

Factor 1: System Satisfaction (17 items) α value=0.98

EPSQUAL factors: Mainly Perceived Public Value (Q13, 19, 23, 30-38); Efficiency (1, 2, 7, 9, 11)

Q1 ROS makes it easy to find what I need.
Q2 ROS makes it easy to get anywhere on the site.
Q7 ROS has comprehensive FAQs.
Q9 ROS is easy to use.
Q11 ROS is well organised.
Q13 On the whole, I am satisfied with the service quality of this website
Q19 I find the service quality of this website to be very satisfactory.
Q23 I would describe the service quality of this website as very satisfactory.
Q30 In terms of service quality, this website is very satisfactory.
Q31 The overall convenience of using ROS.
Q32 The extent to which ROS gives you a feeling of being in control.
Q33 The overall value you get from ROS for your effort.
Q34 I am likely to say positive things about ROS to other people.
Q35 I am likely to recommend ROS to someone who seeks my advice.
Q36 I am likely to encourage friends and others to use ROS.
Q37 I am likely to consider ROS as my first choice for future transactions with Revenue.
Q38 I am likely to use ROS from now on for filing my tax returns.

Factor 2: Technical Trustworthiness (8 items) α value=0.92

EPSQUAL factors: All System Availability's items (Q14-Q17); all Privacy items (Q20-Q21); two Efficiency items (6, Q10)

Q6 ROS loads its pages fast.
Q10 This website enables me to get on to it quickly.
Q14 ROS is always available for business.
Q15 This site launches and runs right away.
Q16 This site does not crash.

Q17 Pages at this site do not freeze after I sign and submit.
Q20 It does not share my personal information with other sites.
Q21 ROS protects information about my tax returns.

Factor 3: Content Satisfaction (5 items) α value=0.90

EPSQUAL factors: All Ease of Completion items (Q3-Q5); Efficiency (Q8); Perceived Public Value (Q39)

Q3 ROS enables me to complete my tax returns easily.
Q4 ROS enables me to file my tax returns quickly.
Q5 ROS enables me to pay my tax easily.
Q8 ROS has useful online demonstrations.
Q39 I am likely to use ROS from now on for payments.

Factor 4: Human Trustworthiness (3 items) α value=0.90

EPSQUAL factors: All Contact items (Q26-28)

Q26 ROS provides a telephone number for problems.
Q27 This site has customer service representatives available online
Q28 It offers the ability to speak to a live person if there is a problem.

Dependent variable: Trust (6 items) α value=0.96

The items were removed by Connolly (2010)

Q12 The ease of use of this website increases my trust in the ROS.
Q18 The reliability of this website (e.g., it never crashes or freezes) increases my trust in ROS.
Q22 Knowing that the privacy of my personal information is protected on ROS increases my trust in the ROS.
Q24 If when filing my tax returns there are any problems, the system highlights them clearly.
Q25 ROS takes care of problems promptly.
Q29 Knowing that this website provides contact details increases my trust in ROS.