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Testing and Validating a Conceptual Framework for Evaluating the Public Value of e-Government using Structural Equation Modelling

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Abstract

This paper develops and validates a conceptual framework for evaluating the public value of e-government in Sri Lanka. The delivery of public services and the efficiency and effectiveness of public organizations are considered based on a comprehensive literature review. Structural equation modelling is used on the survey data collected in Sri Lanka for testing and validating the proposed framework. The study shows that the delivery of quality information, delivery of online services, user orientation of public information and services, efficiency and responsiveness of public organizations, and contributions of public organizations to the environmental sustainability are the critical attributes for evaluating the public value of e-government in Sri Lanka.

Keywords

Public Value, e-Government, Structural Equation Modelling, Sri Lanka

INTRODUCTION

Electronic government (e-government) is often referred to as a process of creating values to citizens through the use of information and communication technologies (ICT) by governments (UNDESA 2003). The rapid advance in ICT greatly facilitates the development of e-government worldwide, and helps to transform the traditional modes of public service delivery to modern citizen-centric e-government service delivery (Beynon-Davies 2005). As a result, the effectiveness and efficiency of the public service delivery are significantly improved with real values created for citizens through provision of convenient access to public services, empowerment through access to information, eradication of distance, and time and cost savings (Heeks 2008).

Following the global trend, the government of Sri Lanka launched the re-engineering government program in 2002 for providing its citizens with transparent and efficient public services. As a result, numerous e-government initiatives have been initiated over the past few years. How these initiatives create values for its citizens is unclear so far as there has been no rigorous assessment of this kind (Karunasena and Deng 2010).

The concept of public value is a popular means for evaluating the performance of public services (Moore 1995). It provides an inclusive framework for examining the performance of public organizations on the creation of public value for citizens (Kelly et al. 2002; Alford and O'Flynn 2009). With the use of this concept, the effectiveness and efficiency of public services can be assessed (Moore 1995; Kelly et al. 2002). E-government offers numerous opportunities for governments to improve the delivery of public services and improve their performance through automating numerous public services (Kearns 2004). With the rapid development of e-government, adopting the concept of public value for evaluating the performance of e-government from the perspective of citizens is not only appropriate but also necessary.

The public value of e-government has not been fully materialised. As a result, various stakeholders start to question the value of their investment in e-government. This leads to much research on the development of various frameworks for evaluating the public value of e-government. For example, Heeks (2008) identifies a set of factors for measuring the public value of e-government from the perspective of public service delivery, achievements of outcomes, and development of trust (Heeks 2008). Golubeva (2007) proposes a conceptual framework for examining the public value of web portals in Russian Federation by focusing on the public value in terms of usability, transparency, interactivity, citizen centricity of e-services, and the level of e-services development (Golubeva 2007). Although several frameworks are used for evaluating the public value of e-government, the validity of these theoretical frameworks for representing the relationship between the different constructs of the framework has not been empirically tested. Furthermore, these frameworks are designed for evaluating the public value of e-government in developed countries. There is a lack of studies on assessing the public value of e-government in developing countries even though such a study would be of great significance to developing countries in formulating their e-government development policies and strategies.

This paper aims to develop and validate a conceptual framework for evaluating the public value of e-government in Sri Lanka. A conceptual framework consisting of (a) the delivery of public services, and (b) the efficiency and effectiveness of public organizations through e-government is proposed. A set of indicators associated with each dimension are identified. The proposed framework is validated and tested with the survey data collected in Sri Lanka using structural equation modelling (SEM). The study reveals that delivery of quality information, delivery of online services, user orientation of public information and services, performance efficiency of public organizations, responsiveness of public organizations, and public organizations' contribution to environmental sustainability are the critical attributes for evaluating the public value of e-government in Sri Lanka.

In what follows, we first review the existing research for evaluating the public value of e-government, leading to the development of a framework for evaluating the public value of e-government. We then present the research methodology followed by a comprehensive analysis of data collected, leading to the validation and testing of the proposed framework. Finally, we present a discussion of the research findings and their implications.

EVALUATING THE PUBLIC VALUE OF E-GOVERNMENT

The concept of public value is used for assessing the performance of public services from the perspective of citizens (Kelly, Mulgan and Muers 2002). Moore (1995) argues that the value to citizens should guide the operations of public organizations in respect of the delivery of public services. This is because the ultimate goal of public programs including e-government initiatives is to create value for citizens (UNDESA 2003). Therefore, the use of the public value concept is appropriate for evaluating the performance of e-government initiatives in terms of the value that e-government has created for citizens.

Public value can be created in many ways. For example, improving the quality of public service delivery produces public value (Kelly et al. 2002). Operating an efficient and effective public organization is another way of creating public value (Moore 1995). Achieving socially desired outcomes such as better education, better employment, alleviation of poverty etc creates public value (Kelly et al. 2002; Try and Radnor 2007). Overall, Jorgensen and Bozeman (2007) develop an inventory of seventy-two kinds of public values in the public value universe. For example, openness, responsiveness, environmental sustainability, user orientation (Jorgensen and Bozeman 2007), and quality information and services (Kearns 2004) are important public value drivers.

There are several important attempts at developing various methodologies for evaluating the public value of e-government from different perspectives. Kearns (2004), for example, proposes a conceptual framework for evaluating the public value of e-government. Indicators including the availability of e-services and information, take-up of e-government services, availability of choice, citizens' satisfaction on e-government services, level of importance of the e-services to citizens, and fairness of e-government services delivery, achievements of outcomes, and development of trust through e-government are considered (Kearns 2004). Having extended the framework of Kearns' (2004), Heeks (2008) derives a similar set of indicators for evaluating the public value of e-government service delivery based on quality of public service delivery (quality is determined by the availability of e-services, take-up, choice, citizens' satisfaction, level of importance of the e-services, fairness), achievement of socially desirable outcomes, and development of trust through e-government. Golubeva (2007) proposes a methodology for examining the public value of e-government portals with respect to usability, transparency, interactivity, citizen centricity of e-services, and level of e-services development.

The frameworks discussed above, however, have various shortcomings in adequately evaluating the public value of e-government in Sri Lanka. One common problem is that the validity of the theoretical frameworks has not been empirically tested. How these frameworks are validated and what methodologies are used to validate the frameworks are not discussed. In addition, the quality of information delivered and the citizen centricity of the public service delivery are not adequately assessed. These frameworks fail to consider the efficiency and effectiveness of public organizations as a source of public value (Moore 1995). They are designed to be used in countries where e-government initiatives are sufficiently mature. Such frameworks are therefore inappropriate for developing countries like Sri Lanka where e-government has not matured as a developed country. Furthermore, it is argued that the meanings and interpretations of public values may vary significantly from state to state, or even from society to society (Jorgensen and Bozeman 2007; Samaratunge and Wijewardena 2009). Therefore, the interpretations of public values adopted in developed nations would be different from the interpretations adopted in developing countries. To adequately address the above issues, a revised framework, which will be empirically validated, is proposed for evaluating the public value of e-government in Sri Lanka.

A CONCEPTUAL FRAMEWORK

The development in e-government in Sri Lanka is at a crucial stage. With huge investment from government and aid organizations, there is an urgent need for a timely evaluation of the performance of various e-government initiatives. Such an investigation helps the government justify its investment in e-government and provides aid

organizations with convincing arguments on the value for their money. Moreover, the experience accumulated and the lessons learned from implementing the e-Sri Lanka program would greatly benefit the donor organizations in their tireless efforts to help other developing countries such as Pakistan, Rwanda, Ghana and Cuba to effectively pursue their e-government developments (Karunasena and Deng 2010).

Sri Lanka launched the e-Sri Lanka program as the first national e-development program in 2002. Under the umbrella of e-Sri Lanka, re-engineering government program was launched for reforming the public sector to provide its citizens with transparent, effective, and efficient public services. Many initiatives have been taken for developing various e-government applications. The development of e-government in Sri Lanka, however, is still far from being mature. As of 2008/2009, Sri Lanka's e-government readiness rank was at 101st globally (UNDESA 2008). Hence, this study takes into account the level of maturity of e-government in Sri Lanka in proposing the conceptual framework. The proposed framework can be a useful yardstick for e-government stakeholders to gauge the public value of e-government initiatives at the organizational level.

As shown in Figure 1, the proposed framework hypothesized that the public value of e-government can be explained by the delivery of public services through e-government and the efficiency and effectiveness of public organizations. The first dimension evaluates the public value of e-government service delivery from the perspectives of (a) delivery of quality information online, (b) delivery of e-services, and (c) user orientation of e-government information and service delivery. Each dimension consists of a set of indicators. The delivery of public services through e-government depends on quality of information, delivery of services (Kearns 2004; Karunasena and Deng 2010), and user orientation of public services (Karunasena and Deng 2010).

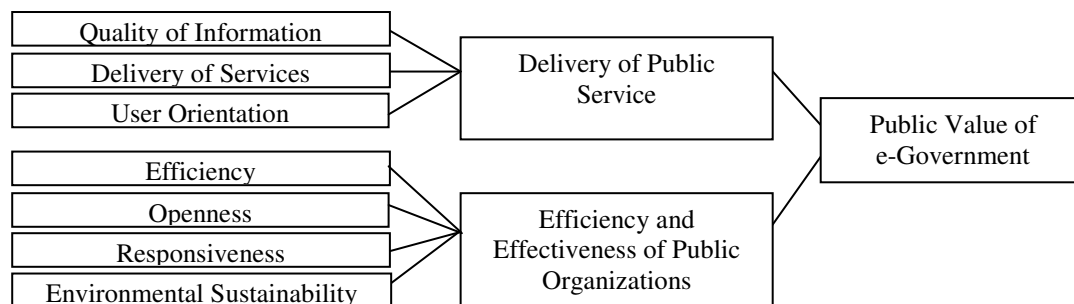


Figure 1: A conceptual framework for evaluating public value of e-government

The quality of information is measured through citizens' perceptions about the value of information available. The quality of information is measured on the accuracy, timeliness, relevance, precision (Wangpipatwong et al. 2005; Klischewski and Scholl 2006), and the level of detail of information. Accuracy of information refers to the error freeness of the information on the websites (Wangpipatwong et al 2005). Timeliness refers to whether the information on websites is current or not (Klischewski and Scholl 2006). Relevancy means that the information on website is relevant to the user's needs (Papadomichelaki and Mentzas 2009). The precision means that the information on website is easy to read and understand (Klischewski and Scholl 2006; Papadomichelaki and Mentzas 2009). The appropriate level of detail means whether the website provides the relevant information in a sufficiently detailed manner so as to meet the needs of the information seeker.

The government uses e-government initiatives to enhance the effectiveness of the public service delivery. The public value of e-government can be measured by citizens' perceptions about the value of complete two-way transactions, real-time interactions between the government and users, the ability to pay online for government services, to fill and submit online forms, and search for information by querying databases and archives.

The user orientation focuses on the citizen-centricity of e-government services delivery. An effective delivery of e-government services requires the adoption of a citizen-centric approach in e-government (Chang et al 2009). Therefore, citizens' perceptions about the user-friendliness of government websites (Yoo and Donthu 2001), of simple and concise websites addresses (Papadomichelaki and Mentzas 2009), of a single website that links other government websites, of a single website which provides all the government information, common look and feel of all the government websites (Yoo and Donthu 2001), and frequently asked questions, (Yoo and Donthu 2001) are important for measuring the citizen-centricity of e-government service delivery.

The efficiency and effectiveness of public organizations are the key indication of public value created through e-government. This can be measured by (a) performance efficiency, (b) openness, (c) responsiveness, and (d) environmental sustainability (Karunasena and Deng 2010). E-government is used to improve the efficiency of public organizations by cutting processing costs, making strategic connections between and among government agencies, and creating empowerment (Heeks 2008). In this context, the performance efficiency of a public

organisation is determined by the development of ICT infrastructure within such public organizations, re-designing of public sector functions for better performance, empowerment of public sector staff with ICT, and the cutting of excess staff by implementing e-government applications to reduce administration burdens on government. Since public organizations run on tax payers' money, citizens value the improved efficiency of public organizations which results in saving tax dollars of citizens.

The openness refers to the transparency of public services (Jorgensen and Bozeman 2007). It indicates the extent to which an organization reveals its decision processes and procedures, and performance information in a timely manner (Jorgensen and Bozeman 2007). A public organization can be open by publishing what it is required to reveal, for example, public policies and budget information (Jorgensen and Bozeman 2007). Publishing of public policy drafts online by government for public consultation, disclosure by public organizations of their budget and expenses online to show their accountability for their expenses, publishing of tenders online by public organizations to increase transparency, ability of citizens to make complaints online, and disclosure of organizational charts and contact information of public officials online by public organizations are the key indicators of openness (Karunasena and Deng 2010).

The responsiveness of public organizations refers to the extent to which a public organization complies with the public's demands (Jorgensen and Bozeman 2007). In e-government, the responsiveness is examined through the citizens' perceptions about the public organizations response to their complaints and inquiries made through e-government access channels, ability to trace the status of applications submitted to government organizations, and through the extent to which citizens charters are displayed online (in Sri Lanka citizens charter is a document issued by the government which specify the minimum number of days that a particular public organization takes to process an application or deliver a service to citizens) (Karunasena and Deng 2010).

Finally, environment sustainability refers to the citizens' expectation that e-government initiatives will contribute to the environmental sustainability. E-government applications can bring many environmental benefits by saving energy, limiting the duplication of effort and resources, sharing data and resources, recycling consumable equipments, and reducing the paper use (ITU 2008). To measure the environmental sustainability, citizens' perceptions about the above benefits were considered as the key indicators of this research.

RESEARCH METHODOLOGY

This study aims to develop and validate a conceptual framework for evaluating the public value of e-government in Sri Lanka. To facilitate this, a conceptual framework is proposed as above by taking into account the nature of e-government development in Sri Lanka as a developing country. The proposed framework is tested and validated using SEM techniques. A research question is formulated as follows: what are the important factors for evaluating the public value of e-government in Sri Lanka?

To adequately answer the research question, the proposed framework has to be validated first. A survey is conducted to collect the data for validating the framework. The questionnaire includes three types of questions aimed at capturing (a) the demographic profile of the participants, (b) the public values that citizens expect from service delivery, and from the operation of efficient and effective public organizations, and (c) citizens' overall perceptions about the public service delivery through e-government in Sri Lanka. The questionnaire uses a seven point likert-type scale where the value "1" represents 'not valuable at all' and the value "7" represents 'highly valuable'. Prior to the distribution of questionnaire, a pilot study was conducted to test the appropriateness of the questionnaire items. Table 2 shows the questionnaire items that are used to validate the framework.

The paper-based survey was conducted in Sri Lanka in between November 2009 and February 2010. The target population is citizens who have used Internet in their daily lives. They represent both urban and rural areas. Approximately 1000 survey questionnaires were distributed. A total of 341 responses are received with a 34.3% response rate. This response rate is in line with the suggestion of Dwivedi et al (2006) that for e-government research the response rate is normally less than 50%. In this research, the reasons for non-response could be respondents' lack of interest in the research topic, their level of education (low education level), or some other social and economical factors. 65 responses are unusable, hence removed from data analysis. The remaining 276 responses are retained. Table 1 shows the demographic profile of the respondents. Data are stored and screened using PASW Statistics for addressing the missing values, outliers, kurtosis, and skews.

The collected data are analyzed using SEM techniques for identifying the critical attributes for evaluating the public value of e-government. Such a technique is required in this research for testing the relationships between measured variables and unobserved constructs, and for estimating the relationships between unobserved constructs. SEM uses various types of models to depict the relationships among observed variables (Schumacker and Richard 2004). To assess and test the initial conceptual constructs, confirmatory factor analysis (CFA) and analysis of moment structures (AMOS) version 18 are used. CFA tests a measurement theory by providing

evidence on the validity of individual measures based on the model's overall fit and other evidence of the construct validity (Hair et al. 2010). To assess the model's overall fit, various goodness-of-fit (GOF) measures were used including chi-square (χ^2), the ratio of χ^2 to degree of freedom (χ^2/df), the GOF index (GFI), root mean square error of approximation (RMSEA), Tucker-Lewis index (TLI), and comparative fit index (CFI). The maximum likelihood estimation technique is used in this research to estimate the parameters in the model.

Table 1. Respondents Demographic Profile

Age Profile		Educational Profile		Employment Profile			
Age Group	Percent	Category	Percent	Category	Percent	Category	Percent
16-20	6.9%	School Level	22.8%	IT/Computer	42%	Medical/Health	6.5%
21-30	54.3%	Under graduate	31.9%	Teaching	14.1%	Trading	4.3%
31-45	34.1%	Post graduate	21.4%	Finance	6.2%	Student	4.3%
46-60	3.6%	Professional	23.9%	Travel	2.2%	Un employed	6.9%
Over 60	1.1%			Agriculture	0.4%	Other	11.6%

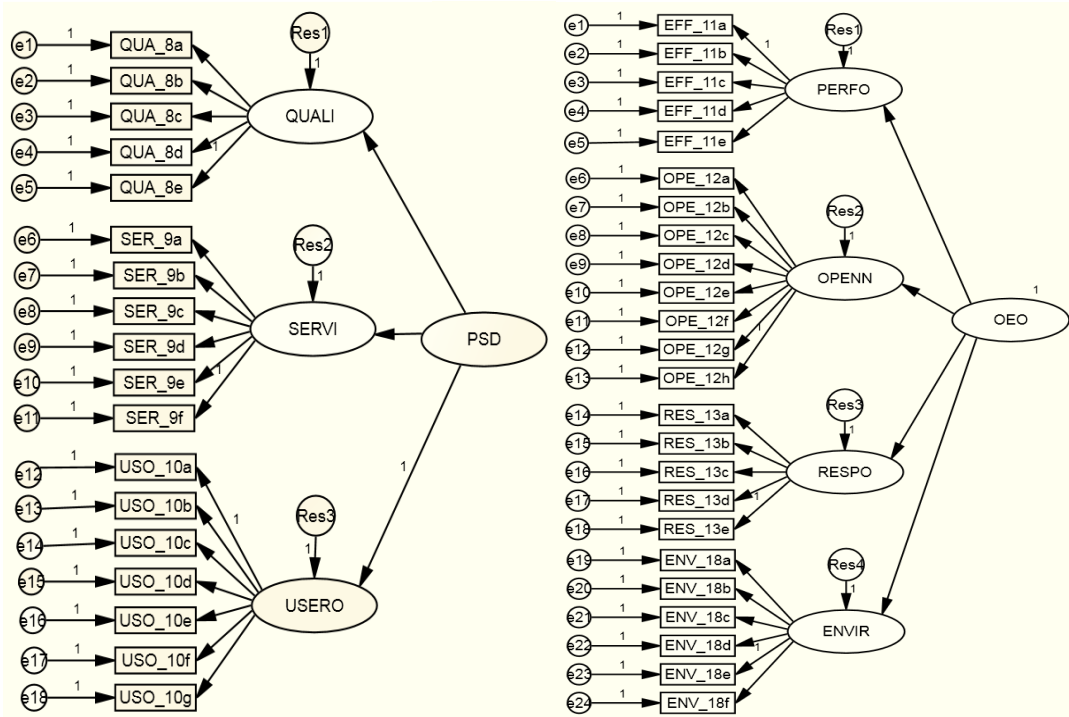
Table 2. A Brief Description of the Items used for Validating the Framework

<p>Q8- Public value of the delivery of quality information QUA_8a - Accurate information QUA_8b - Relevant information that meets your needs QUA_8c - Up-to-date information QUA_8d - Information with the right level of detail QUA_8e - Simple and understandable information</p>	<p>Q12- Public value of improving the openness OPE_12a - Public policy drafts online for public consultation OPE_12b - Disclose budget online OPE_12c - Annual plan and progress online OPE_12d - Publish tenders online to increase the transparency OPE_12e - Citizens make complaints online OPE_12f - Display their contact information online OPE_12g - Display staffs contact information online OPE_12h - Display organizational charts, duties and responsibilities of public sector staff</p>
<p>Q9- Public value of service delivery initiatives SER_9a - Ability to do government services online SER_9b - Pay online SER_9c - Fill and submit online application forms SER_9d - Search information in databases SER_9e - Download and use government application forms SER_9f - Download archives</p>	<p>Q13- Public value of improving the responsiveness RES_13a - Display citizen charter online RES_13b - Response to your online complaints and inquiries RES_13c - Follow up emails for inquires RES_13d - Online case tracking RES_13e - Automatic responses to online submissions</p>
<p>Q10- Public value of citizen-focused service delivery USO_10a - Well organized and user friendly website content USO_10b - Simple (easy to remember) website addresses USO_10c - A single website with links to other websites USO_10d - All government information from a single window USO_10e - Common look and feel of government websites USO_10f - Websites for none internet savvy people USO_10g - Frequently asked questions (FAQs)</p>	<p>Q18- Public value of environmental sustainability ENV_18a - Switch off computers and printers ENV_18b - Developing e-government applications which help to limit duplication effort and resources ENV_18c - Reduction of paper printing (double side printing) ENV_18d - Recycling consumable equipments ENV_18e - Retire energy inefficient computers systems ENV_18f - Implementing 'Green Information Technology' policies within the government</p>
<p>Q11- Public value of improving the efficiency EFF_11a - IT enabled public service counters EFF_11b - Re-designed public organizations for better performance EFF_11c - Improved ICT infrastructure EFF_11d - Empowered public sector staff with ICT EFF_11e - Cut excess staff by implementing information systems</p>	

DATA ANALYSIS

Figures 2a and 2b show two initial measurement models developed for the public service delivery dimension and the efficiency and effectiveness of public organizations dimension. The measurement model for the public service delivery (PSD model) consists of e-government public service delivery (PSD), quality information (QUALI), delivery of services (SERVI), and user orientation (USERO). In the initial model, five indicator variables (QUA_8a to QUA_8e) are postulated to load on the first order construct QUALI. Another six indicator variables (SER_9a to SER_9f) are loaded on construct SERVI, and the remaining seven indicator variables (USO_10a to USO_10g) are loaded on USERO. The measurement model for the efficiency and effectiveness of public organizations (OEO model) consists of operating an efficient and effective public organization through e-government (OEO), performance efficiency (PERFO), openness (OPENN), responsiveness (RESPO), and environmental sustainability (ENVIR). Five indicator variables (EFF_11a to EFF_11e) are loaded on the first order construct PERFO, eight indicator variables (OPE_12a to OPE_12h) loaded on construct OPENN, five indicator variables (RES_13a to RES_13e) on construct RESPO, and six (ENV_18a to EFF_18f) on construct ENVIR. None of the indicator variables in either model are cross loaded on multiple constructs.

As shown in Figures 2a and 2b, the measurement models use reflective constructs and reflective indicator variables which lead to reflective SEM. For example, Figure 2a shows that the higher order construct, public value of public service delivery (PSD), is reflected, rather than influenced, by the citizens' perceptions about the value of quality information (QUALI), delivery of services (SERVI) and user orientation (USERO).



2a: PSD measurement model

2b: OEO measurement model

To evaluate the measurement properties of the models and their constructs, convergent validity, discriminant validity, and factorial validity are examined. Convergent validity is assessed by (a) the significance of the factor loadings of all items, (b) construct reliability, and (c) average variance extracted (Bhattacharjee and Premkumar 2004). Standardized factor loading (SFL) for each observed item should be at least 0.5 to be considered as significant (Chau 1997; Hair et al. 2010). Construct reliability (CR) for each construct is computed as the square of summation of factor loadings divided by the sum of the square of summation of factor loadings and the summation of error variances with CR between 0.6 and 0.7 acceptable (Hair et al. 2010). The average variance extracted (AVE) is computed as the total of all squared standardized factor loadings divided by the number of items with an AVE of 0.5 or higher for adequate convergent validity (Hair et al. 2010).

Constructs that pass the convergent validity test are retested for discriminant validity which measures the extent to which the conceptually similar constructs are distinct. To get satisfactory discriminant validity, the square root of AVE for each construct should be greater than the correlation between the constructs (Hair et al. 2010). Subsequently the factorial validity test was conducted for the constructs that pass discriminant and convergent validity to represent the same higher level construct.

The initial PSD model (Figure 2a), and the OEO model (Figure 2b) were evaluated for their validity by performing CFA. The initial PSD model's overall GOF as indicated by GFI (0.869), RMSEA (0.073), TLI (0.876), CFI (0.891) and p-value (0.000) appears as an inadequate fit. The initial OEO model's overall GOF fit also inadequate with GFI (0.847), RMSEA (0.066), TLI (0.871), CFI (0.883) and p-value (0.000). This led to a re-examination of congeneric one factor models for each individual construct. These models were re-specified based on the assessment of standardized factor loading and modification indexes. This led to drop several items from the one factor congeneric models. Table 3 shows the GOF results of the PSD model, the OEO model, and the one factor congeneric model with adequate level of model fit. The GOF results of the PSD model is within the acceptable range with RMSEA (0.000), GFI (0.987) TLI (1.0), CFI (1.0), and p-value (0.595). The GOF results of the OEO model is also within the acceptable range with RMSEA (0.000), GFI (0.982) TLI (1.0), CFI (1.0), and with p-value (0.465).

To fulfil the convergent validity tests, CR of each construct was calculated. As shown in Table 4, except the construct openness (OPENN) all the constructs meet the acceptable CR criteria (0.6 to 0.7). Moreover, except for OPENN construct, AVEs for each of the other constructs' are greater than 0.5, suggesting adequate convergent validity. Furthermore, item reliabilities (SFL) of each indicator variable of the full measurement model also met the acceptable value (0.5), except for construct OPENN. Due to inadequate convergent validity (CR 0.54 and AVE 0.45) results for OPENN, the construct was dropped from the model.

Table 3. The GOF Results after Model Re-specification

	No. of Items	x ²	x/df	P	GFI	TLI	CFI	RMSEA
Recommended value (Hair et al 2010; Byrne 2010)	NA	NA	NA	>.05	>.95	>.95	>.95	< .05
Quality Information (QUALI)	4	2.072	2.072	0.150	0.996	0.062	0.998	0.062
Services Delivery (SERVI)	4	3.252	1.626	0.197	0.994	0.990	0.997	0.048
User Orientation (USERO)	4	2.745	1.626	0.254	0.994	0.993	0.998	0.037
Performance Efficiency (PERFO)	4	1.022	0.511	0.600	0.998	1.000	1.000	0.000
Openness (OPENN)	4	5.144	2.572	0.076	0.990	0.963	0.988	0.076
Responsiveness (RESPO)	4	1.579	0.789	0.454	0.997	1.000	1.000	0.000
Environmental Sustainability (ENVIR)	6	10.786	1.198	0.291	0.987	0.996	0.997	0.027
Public Service Delivery (PSD) Model	8	15.008	0.833	0.595	0.987	1.000	1.000	0.000
Effective Public Organization (OEO) Model	9	23.949	0.998	0.465	0.982	1.000	1.000	0.000

Table 4. The Convergent Validity of the Test Results

	CR	AVE	Description of the indicator variable	Variable	SFL
Quality Information (QUALI)	0.74	0.68	Up-to-date information	QUA_8c	0.807
			Information with the right level of detail	QUA_8d	0.840
Services Delivery (SERVI)	0.64	0.60	Search interactive information (simple e-services)	SER_9d	0.735
			Download online forms	SER_9e	0.796
			Download archives	SER_9f	0.785
User Orientation (USERO)	0.67	0.55	Simple and meaningful URLs for government websites	USO_10b	0.820
			Web indexes	USO_10c	0.720
			All government information from a single window	USO_10d	0.673
Efficiency (PERFO)	0.74	0.58	Improve ICT infrastructure in government organizations	EFF_11c	0.710
			Empower public staff with ICT skills	EFF_11e	0.794
Openness (OPENN)	0.54	0.45	Publish government tenders online	OPE_12d	0.516
			Facility to make complaints online	OPE_12e	0.443
			Public organizations display their contact info online	OPE_12f	0.464
			Display organizational chart, duties, responsibilities	OPE_12h	0.369
Responsiveness (RESPO)	0.69	0.64	Response to citizens complaints and inquires online	RES_13b	0.865
			Follow up emails	RES_13c	0.756
			Online case tracking	RES_13d	0.772
Environmental Sustainability (ENVIR)	0.72	0.57	e-Government help to limit duplication effort and resources	ENV_18b	0.737
			Reduction of paper printing	ENV_18c	0.758
			Recycling consumable equipments	ENV_18d	0.763
			Adopt green IT concepts in government	ENV_18f	0.762

Constructs that passed convergent validity test are tested for discriminant validity. The high correlation estimation (0.88) between the two second order constructs PSD and OEO suggest to combine them into a single one (PUBVA). This shows that there are no two separate dimensions for public value creation as PSD and OEO. As shown in Table 5, all the constructs are passed the discriminant validity test. It demonstrates that the discriminant validity between each pair of constructs with AVE square roots is greater than the correlation estimation between constructs. For example, QUALI construct showed the highest discriminant validity among other constructs. The square root of AVE for QUALI was 0.82 while correlations between QUALI and other constructs ranged from 0.296 to 0.472.

Table 5. Discriminant Validity Test Results

Constructs	QUALI	SERVI	USERO	PERFO	RESPO	ENVIR
QUALI	0.82					
SERVI	.387	0.77				
USERO	.472	.635	0.74			
PERFO	.462	.626	.599	0.76		
RESPO	.296	.486	.468	.560	0.80	
ENVIR	.387	.416	.481	.507	.594	0.75

The factorial validity test is conducted for assessing whether the factors that pass convergent validity and discriminant validity tests represent the same higher level construct (PUBVA), and to detect and drop any cross-loading items. The results show that higher order (second order) factor model has sufficient validity. GOF of the final measurement model are within the acceptable range. P-value for the model is 0.086. Since $p > 0.05$, it is tenable that the model is an adequate fit to the data. Moreover, the fact that the GFI (0.954) is greater than 0.95 suggest that the model is approaching an adequate fit. Similarly, both the TLI (0.986) and the CFI (0.989) are

greater than 0.95, suggesting that the model is approaching a perfect fit. Furthermore, the RMSEA (0.028) is less than 0.05 with a PCLOSE value of 0.984 (PCLOSE > 0.05) and the lower end of the 90% confidence interval (LO 90) equals zero (0). This is strong evidence that final model being adequate fit is tenable.

RESEARCH FINDINGS

The structural model in Figure 3 shows that a strong support is evident for the paths of PUBVAL → QUALI, PUBVAL → SERVI, PUBVAL → USERO, PUBVAL → PERFO, PUBVAL → RESPO, and PUBVA → ENVIR with path coefficient values of 0.55, 0.75, 0.77, 0.83, 0.65, and 0.66 respectively (p<0.001). Furthermore, the model accounts for 31% of the variance in quality information (QUALI), 56% in service delivery (SERVI), 59% in user orientation (USERO), 70% in performance efficiency (PERFO), 43% in responsiveness (RESPO), and 44% in environmental sustainability (ENVIR) in terms of its explanatory power. This shows that the quality of information provided, delivery of e-services, user orientation of e-government information and services, performance efficiency of public organizations, responsiveness, and public organizations' efforts to contribute to a sustainable environment are the important attributes in evaluating the public value of e-government. Furthermore, the analysis reveals that improving the openness of public organizations through e-government is a non-critical factor in this situation. During the measurement model analysis stage, the openness factor was dropped due to the insufficient convergent validity.

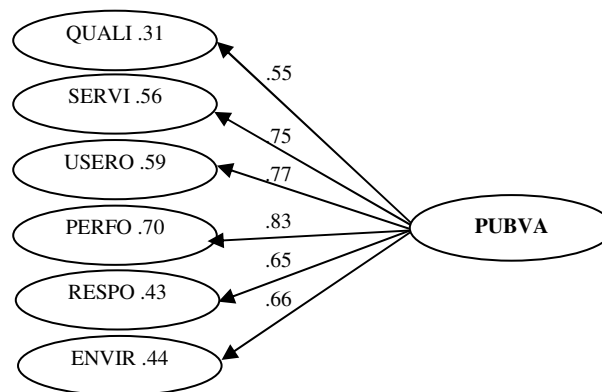


Figure 3: The structural model

The respondents value the provision of up-to-date information with an appropriate level of detail through e-government channels. However, the analysis reveals that the quality of information is the least contributing factor, explaining only 31% of the variance. The delivery of e-services is an important attribute for the public value evaluation of e-government. The analysis reveals that the ability to search interactive information, download government applications, and download archives such as government reports, gazettes etc are crucial for evaluating the public value of e-government in Sri Lanka. It is surprising to observe that respondents consider such immature e-services as valuable rather than mature two-way transactions and online payment initiatives. One possible explanation for this is that a lack of awareness among respondents about the available e-services. For example, e-revenue license systems are an implemented e-service which allows citizens to obtain revenue licenses for their vehicles online. However, the awareness about this service is very low. On the user orientation of e-government services delivery, the analysis suggests that citizen-centric features of e-government service delivery channels such as simple and easy to remember website addresses, a web portal linking all the websites, and a single window with all the service are important for public value evaluation of e-government in Sri Lanka.

The performance efficiency of public organizations is identified as the most crucial factor for evaluating the public value of e-government. It explains 70% variance of the model. A detailed analysis reveals that citizens value improving ICT infrastructure within public organizations through layering computer networks, developing data repositories, and developing e-administrative applications which leads to better performance. Since public organizations run on tax payers' money, public expect the government to improve organizations' efficiency by cutting costs and improving organizational performances through e-government. While improving the ICT infrastructure, citizens expect the government to empower the public sector staff with necessary ICT skills. Although implementing e-government is a way of saving money for both government and tax payers, the analysis reveals that citizens do not value saving money by cutting staff from e-government implementation.

The structural model suggests that improving the responsiveness of public organizations through e-government is an important factor for evaluating the public value. The study reveals that the ability to make online inquires and complaints are valued by the citizens. They also expect the government to show its responsiveness by

replying to their inquiries or complaints through various e-government delivery channels. Moreover, they also value the ability to trace the status of the applications that they submitted to government organizations.

The perception of citizens about e-government's contributions to environmental sustainability is positive. Developing e-government applications for limiting the duplication effort and resources, reduction of paper usage by introducing electronic copies, double side printing, recycling ICT equipments used and recycling papers are valuable for contributing to environmental sustainability. Hence using e-government for environmental sustainability is regarded as a critical factor which accounts for 44% variance of the model.

The proposed framework consists of two dimensions of public value creation through e-government, namely, delivery of public services, and efficiency and effectiveness of public organizations. However, the high correlation between the two second order constructs PSD (delivery of public services) and OEO (efficient and effective public organization) suggests these are not two distinct dimensions of public value evaluation through e-government. Hence, the public value evaluation model has been revised as shown in Figure 3.

CONCLUSION

This paper develops and validates a framework for evaluating the public value of e-government in Sri Lanka. A conceptual framework is hypothesized by reviewing the relevant literature. The hypothesized framework is validated using survey data collected in Sri Lanka based on SEM. The study reveals that the quality of information, delivery of e-services, user-orientation of e-government service delivery, performance efficiency of government organizations, responsiveness, and government organizations' contribution to environmental sustainability are the critical attributes for evaluating the public value of e-government in Sri Lanka.

This study is undertaken as a part of our main research work in examining the public value of e-government in Sri Lanka. Due to the time constraint in analysing data, this study focused only on the public value created through the public service delivery and the efficiency and effectiveness of public organizations. The public value drivers of equity, self development, participation democracy, and confidentiality are not considered. Further research work is required for validating the revised framework with a revised survey instrument. The revised framework will be reported in future information systems conferences.

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