

## **E-GOVERNMENT AND THE PUBLIC VALUE OF ENVIRONMENTAL SUSTAINABILITY (PVES): A DEVELOPING COUNTRY PERSPECTIVE**

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### **Abstract**

This study empirically investigates the relationship between e-government and PVES from the citizens' perspective. The DeLone and McLean Information System Success Model and the Public value theory (PVT) were used as the foundational theories. A questionnaire was administered to 369 experienced users to gather data. The collected data was analysed using PLS-SEM. All hypotheses were significant. The key findings are that PVES is predicted by the quality dimensions of an information system, satisfaction, and use. This study has helped establish the value and the possibility of achieving environmental sustainability through the use of e-government by the citizens. The adoption of technology in the public sector instead of conventional means such as relying heavily on paper for disseminating information and service delivery in a developing country has a significant impact on the campaign for environmental sustainability.

**Keywords:** E-government success, Environmental Sustainability, Public value, Satisfaction, Actual use

### **Introduction**

The deteriorating nature of the planet, particularly in developing countries, has become a serious global concern. Over the years, the quest for economic growth and development has resulted in deforestation, pollution, and environmental degradation, posing severe environmental threats begging for attention. Therefore, environmental sustainability is becoming increasingly vital to sustainable development. For instance, the United Nations 2030 sustainable development agenda has 17 environmental sustainability-related goals. Consequently, the difficulty of achieving sustainable development in a developing country has forced governments to reconsider their policy and administrative systems through the ongoing policy reforms and modernisation of the state bureaucracy, which is motivated by the New Public Management (NPM) principles (Homburg, 2004). The administrative and innovation reform policies are expected to help public managers achieve effectiveness, efficiency, and social integration by integrating modern management techniques such as information and communications technology (ICT) into governance, otherwise known as e-government.

A number of Nigerian e-government initiatives were launched in the early 2000s following the adoption of the National Communications Act in 2003, approval of the National Information Technology Policy in 2001, and establishment of the National

Information Technology Development Agency in 2007 (Abdulkareem & Ishola, 2016). Implementing e-government was to solve the problem of excessive public service bureaucracy by giving the government ways to improve its productivity, efficiency, and transparency in delivering public services (Fatile, 2012; National eGovernment Strategies, 2019). Since its inception, the government has provided citizens with services such as international passport issuance and renewal, electronic national identity cards, driver's licenses, company registration, and online tax filing via web and mobile platforms (Abdulkareem & Ishola, 2016).

Perceptions from different studies suggest that the rise of e-government, which is the application of ICT into the governance system, would solve growing global carbon footprints (Lee, 2017). As a result, ICT should give governments additional chances to start initiatives like smart cities, e-solid waste management, smart grids, smart buildings, efficient street lighting, smart public gardens, and transportation services to enhance environmental sustainability (Perez-Gonzalez & Daiz-Daiz, 2015). One of the growing influences of e-government is advancing environmental sustainability and averting and minimising the risk of environmental shocks. In Al-Khouri (2013)'s assessment, environmental sustainability is the hidden side of e-government programs. In order for the government to meet its environmental goals, e-government is one of the key projects it should grow (Krishnan et al., 2013). Estevez et al. (2013) argued in their study that e-government research should focus on sustainable development. As Lee (2017) found, e-government also contributes to environmental sustainability in Small Island Developing States (SIDS), which in turn indirectly improves the effectiveness of e-government.

ICT and e-government's role to support environmental sustainability is one of the new research areas and a competing challenge for public sector managers to fulfil. However, not much has been done in this regard concerning developing countries. For example, Estevez and Janowski's (2013) research showed a few research pieces to showcase the interrelationships between e-government and environmental sustainability. Another major problem area is quantifying the real benefits of e-government, especially concerning environmental sustainability. Similarly, Sapraz & Han (2021) examined the collaborative efforts of citizens and the government in digital government to solve environmental issues. These studies have mainly emphasised efficiency and cost savings as the ultimate goals of e-government implementation. However, recent studies have demonstrated empirically that cost efficiencies should not form the only reason for e-government projects. Therefore, the benefits of any IS initiative in the public sector should be based on underlying important socio-political objectives and values perceived by the users (Chircu & Lee, 2005). In line with this thought, the citizens are the ultimate users and co-producers of environmental initiatives in the public value ecosystem. The collective expectations of residents who benefit from public services are based on public value (Moore, 1995). As a result, environmental sustainability, as one of the derivatives of the social dimensions of IS's public value, should be assessed from people's perspectives (Deng et al., 2018).

While the shortage of empirical research forms the main gap for this current study, there is also a deficiency of investigations that examines the relationship between electronic government and environmental sustainability from the citizens' perspective in a developing country like Nigeria. E-government has been observed in Nigeria as a mix of failure and success (Abdulkareem & Ishola, 2016; United Nations, 2020). Similarly, as the country is faced with climate change, environmental degradation, and budget and resource constraints, the government needs to conserve resources and promote the implementation of e-

government among the citizens. Therefore, this study attempts to cover these gaps by adopting the DeLone and Maclean IS success model for understanding the link between e-government and the public value of environmental sustainability (PVES). This present study will contribute to the ongoing research on the socio-economic and political gains of e-government on two folds. First, this study pursues to improve on the scarce but growing literature on the link between ICT in the public sector and environmental sustainability mainly from the citizens' perspective, highlighting the perception of use and performance. Also, the need to focus on environmental sustainability was borne out of the current challenge of climate change in developing countries like Nigeria and how the adoption of e-government by the citizens can be a tool to promote environmental sustainability.

### **Theoretical Background and Hypotheses Formation**

#### ***PVES***

Using public value as a measure of performance in public administration is a new paradigm, which is gaining traction in public sector research. It establishes the foundation for analysing public organisations' effectiveness in meeting people's social and economic services (Alford & O'Flynn, 2009). The public value, as noted by Benington (2011), are the things that the public values and contribute to public value. These two interpretations support the formation of an innovative idea for evaluating public-sector operations from the producers' perspective to the users. As a result, the public value provides an innovative and superior paradigm for explaining the general public's welfare through its effect on public services (Benington, 2011).

The underlying aims and motives represented in the actualisation of any undertaking are referred to as values. They indicate the utility of an entity that is deemed reasonable and 'ends-in-view' while evaluating certain programs or initiatives (Esteves & Joseph, 2008). Values are typically defined as guiding principles or rationales for choosing and assessing individuals, policies, events, and activities that measure criteria. Values are often characterised as desirable objectives that individuals anticipate or try to achieve. As explored in diverse publications, several sorts of values arrive in various forms. Environmental sustainability is defined as the environmental advantages and aspirations of citizens who use e-government for environmental preservation. Some of the values of environmental sustainability found in the literature are energy saving (Al-Khouri, 2013; Deng et al., 2018), limitation in effort duplication through automation of tasks, reduction in paper usage (Al-Khouri, 2013), recycling of energy consumables (ITU, 2008) and promotion of green information technology policy (Lim & Tang, 2008).

#### ***DeLone and McLean Information System Success Model***

This model is a frequently used IS success model for assessing the impact of IS quality on e-government. It aims to offer a wider and deeper knowledge of the effectiveness of the IS system by identifying, characterizing, and systematizing the connections between the quality attributes. Given that it provides a helpful framework for evaluating the multidimensionality of IS performance, it also gives a baseline for defining and explaining the computation of the dependent variable in IS research. Additionally, the methodology for this study was built to successfully solve the fundamental trouble of estimating the net benefits of IS.

The model is predicated on the notion that the effectiveness and efficacy of an IS project can be anticipated based on the combined or independent impact of the quality aspects of IS (quality of information, service and system) on utilization, intention to use, satisfaction,

and net benefit. Furthermore, the model contends that the quality of information is determined by its correctness, completeness, simplicity of comprehension, and recentness. Furthermore, information quality differs from system quality, which assesses the portal's technical aspects such as navigation, usability, and security. Finally, the online portal's timeliness, dependability, and tangibility determine the service quality.

### ***Actual Use of E-government***

Actual use refers to how frequently, how complexly, and how long a person utilises an information system (DeLone and McLean, 2016). It also implies that the impact of efficiency aspects on IS utilisation should be investigated. The type and amount of actual use have been examined and observed using the quality of IS as a predictor. The correctness, comprehensiveness, understandability, and suitability of the information supplied on the e-government site are all factors that can help forecast why individuals would utilise it. A sound information system must provide complete, accurate, and easy-to-understand information, forecasting its use (Hidayanto et al., 2017). Privacy and security, the convenience of browsing websites, quick navigation, frequently asked questions (FAQ), site maps, succinct and plain website URLs, and a nice and straightforward interface are all factors that impact e-government usage (Deng et al., 2018; Hirwade, 2010; Papadomichelaki & Mentzas, 2009). Therefore, we hypothesise:

H1: The actual use of e-government is predicted by information quality.

H2: The actual use of e-government is predicted by service quality

H3: The actual use of e-government is predicted by system quality.

### ***User Satisfaction***

The quality of the information, system and service are the three qualities that DeLone and McLean (2003) suggest for each IS domain. User satisfaction is affected by each of these variables. The utility of the services, which is a crucial underlying component, has a considerable impact on how citizens perceive the quality of services offered on online platforms (Kearns, 2004). The perceived significance attached to individuals using the e-government system is one of the primary factors that determine whether a service is used or not. The degree of satisfaction that IS users have with the privacy, usability, substance, correctness, and usefulness of the information offered on the e-government platform is referred to in the context of this study as satisfaction. Users' satisfaction with IS is influenced by the quality of the information, services, and systems. Therefore, we hypothesise thus:

H4: User satisfaction with e-government is predicted by information quality.

H5: User satisfaction with e-government is predicted by service quality.

H6: User satisfaction with e-government is predicted by system quality.

### ***PVES***

The adoption of e-government and its satisfaction are two critical factors in assessing its performance. In addition, the level of quality of the system, service, and information supplied by government entities influences use. As a result, for individuals to transfer their focus from traditional to electronic service delivery, there must be some amount of simplicity and appeal through quality dimensions. Several researchers have looked into the relationship between the

use of IS and the net advantages it provides (Aldholay et al., 2018; Martins et al., 2019). The application of IT for environmental sustainability is about creating an avenue for renewable energy, energy conservation policy, energy-saving, less duplication of efforts, share and of resources and energy (Deng et al., 2018). Therefore, for e-government to achieve these values, citizens must use e-government and be satisfied with the quality made available by the government (Mellouli et al., 2020). Therefore, we hypothesise:

H7: The actual use of e-government influences PVES.

H8: User satisfaction influences PVES.

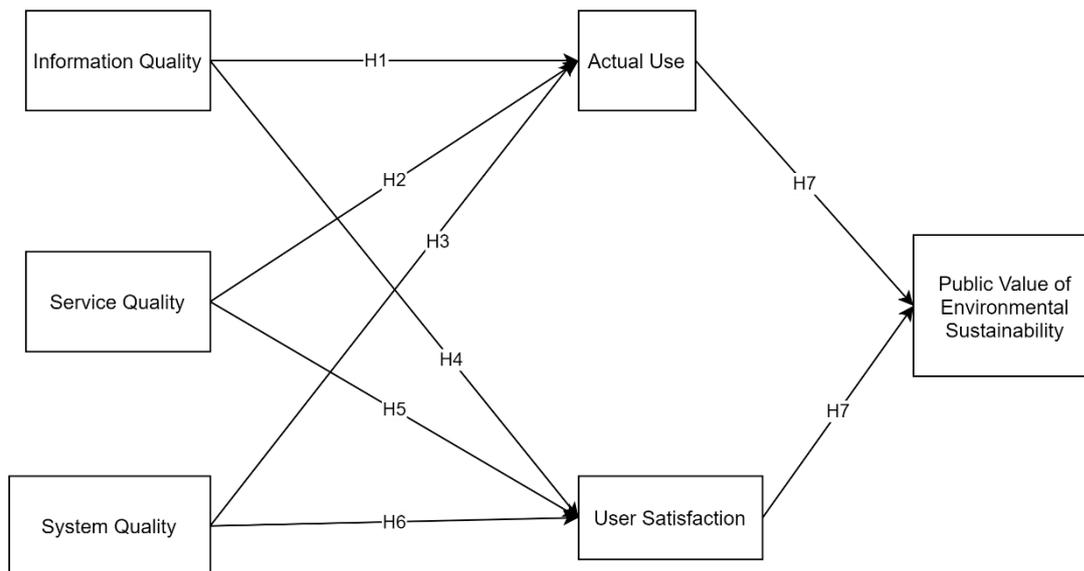


Figure1: Research model

Source: Author’s Conceptualisation

## Methodology

A self-administered survey provided the data required to test the hypotheses. There were 450 questionnaires distributed and 369 of which were useable. The respondents were selected based on prior experience with e-government use via internet portals. In addition, the survey collected data on the respondent’s demographics. The majority of respondents are young, educated, e-government frequent users and have access to ICT. We used the full collinearity test to identify common method bias. The results showed that all values were below the 3.3 thresholds, as shown in Table 1. Therefore, common method bias is not an issue for this study.

The survey included items used to measure many constructs used for this study, as shown in Table 2. Deng et al. (2018) and Molla et al. (2009) measurement items were used for the PVES. Spreng et al. (1996) measurement items were used to measure satisfaction with e-government service, while Urbach and Müller (2012)’s measurement items were adapted for the Actual use of e-government and the quality dimensions.

***Measurement Model***

The measurement model result as presented in Table 2 showed that the composite reliability and average variance extracted for all constructs were above the 0.7 and 0.5 thresholds, respectively. The result for the Heterotrait and Monotrait (HTMT) values used to assess the discriminant validity, as displayed in Table 2, revealed that the values found were below the 0.85 threshold.

Table 1: Measurement Model Result

<b>Constructs</b>	<b>Loadings</b>	<b>CR</b>	<b>AVE</b>	<b>VIF</b>
Information Quality	0.840	0.782	0.614	1.340
	0.790			
	0.801			
	0.821			
	0.643			
Service Quality	0.719	0.904	0.612	1.730
	0.823			
	0.845			
	0.772			
	0.764			
System Quality	0.719	0.918	0.692	1.560
	0.823			
	0.845			
	0.772			
	0.764			
Satisfaction	0.760	0.892	0.674	2.210
	0.869			
	0.841			
	0.810			
Actual use	0.832	0.896	0.634	2.190
	0.725			
	0.873			
	0.849			
Net Benefits (PVES)	0.886	0.959	0.823	1.360
	0.879			
	0.935			
	0.915			
	0.895			

Source: Research Findings

Table 2: Discriminant validity (HTMT)

	1	2	3	4	5	6
1						
2	0.314 (0.220, 0.408)					
3	0.479 (0.386, 0.568)	0.667 (0.608, 0.725)				
4	0.514 (0.438, 0.597)	0.441 (0.355, 0.523)	0.630 (0.559, 0.695)			
5	0.263 (0.183, 0.380)	0.733 (0.684, 0.778)	0.577 (0.487, 0.660)	0.402 (0.308, 0.498)		
6	0.494 (0.414, 0.567)	0.615 (0.548, 0.753)	0.673 (0.595, 0.753)	0.436 (0.319, 0.552)	0.535 (0.440, 0.626)	

Source: Research Findings

Note: 1 = Information quality 2 = Environmental Sustainability 3 = User Satisfaction 4 = Service quality 5 = System quality 6 = Actual use

### **Structural Model**

As shown in Table 3, the result recognized that collinearity problems do not occur in the data set as all values are below the 3.3 thresholds. We also examined the explanatory power of the research model through the  $R^2$  values. The quality of e-government accounted for 50% (0.495) variance total for user satisfaction and  $R^2 = 34.4\%$  (34%) for actual use of e-government. Actual use and user satisfaction explain  $R^2 = 0.441$  (44%) variance total for the PVES. Further analysis of the results indicated that the effect sizes ( $f^2$ ) of the significant relationships were attained within the range of small to moderate effect sizes based on the threshold of 0.02 (small), 0.15 (moderate) and 0.35 (large). The relationships between actual, actual use and the PVES ( $f^2 = 0.149$ ), user satisfaction and PVES ( $f^2 = 0.194$ ), service quality and user satisfaction ( $f^2 = 0.144$ ), system quality and actual use ( $f^2 = 0.190$ ) all generated moderate effect sizes. While the relationships between information quality and actual use ( $f^2 = 0.098$ ), system quality and user satisfaction ( $f^2 = 0.070$ ), service quality and actual use ( $f^2 = 0.015$ ) all generated small effect sizes. The path coefficient result as shown in table 3 showed that in the direct relationships, seven of the hypothesized paths were significant at  $p < 0.001$  and two at  $p < 0.05$ .

Table 4: Test of Hypotheses

	Relationship	$\beta$	t-value	p-value	Confidence Interval		Decision
					5%	95%	
H1	IFQ -> USE	0.280	5.164	0.000	0.191	0.368	Supported
H2	SVQ -> USE	0.115	1.663	0.048	0.005	0.231	Supported
H3	SYQ -> USE	0.381	6.541	0.000	0.278	0.469	Supported
H4	IFQ -> SAT	0.097	1.975	0.024	0.012	0.175	Supported
H5	SVQ -> SAT	0.315	7.535	0.000	0.242	0.380	Supported
H6	SYQ -> SAT	0.221	4.508	0.000	0.140	0.299	Supported
H7	USE -> PVE	0.350	8.425	0.000	0.276	0.414	Supported
H8	SAT -> PVE	0.400	8.984	0.000	0.324	0.470	Supported

Source: Research Findings

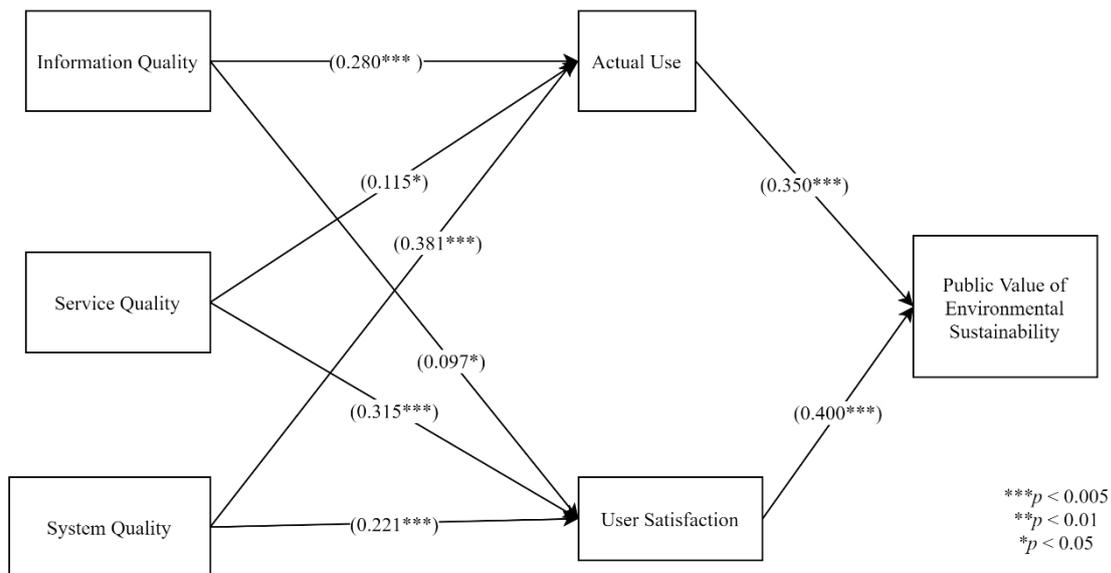


Figure 2: Structural model result

Source: Research Findings

### Discussion and Implications

The link between e-government quality and PVES is investigated. In contemporary times, there has been much interest in the use of public value to analyse the socio-political benefits of e-government performance. This study's outcomes corroborate IS Success's assumptions and previous research findings. Findings from this study established the significance of ICT use in the public sector for attaining environmental sustainability. Using technology in the public sector instead of traditional methods for disseminating information and providing services, such as depending primarily on paper, has a huge influence on the environmental sustainability campaign. It has been proven that peoples' capacity to use information technology to conserve energy and reduce paper usage contributes significantly to environmental sustainability. These findings are consistent with other research; such as Wunderlich et al. (2012) found residents' usage of smart metering for energy had a favourable environmental advantage to society. Similarly, it corroborates the findings of Ho et al. (2015), who found a favourable link between environmental sustainability and the usage of smart card technology.

The model used in this study also highlighted how important the quality aspects (information quality, service quality, and system quality) are for real usage and user satisfaction with e-government to achieve environmental sustainability. These findings are consistent with the studies of Aldholay et al. (2018) and Chen et al. (2018). This finding further emphasises the necessity of delivering up-to-date, easy-to-understand, accurate and trustworthy information to e-services consumers. For offering great e-services, characteristics like the capacity to pay for online services, accessibility, and presence of services supplied by government webpages are also critical (Wangpipatwong et al., 2009). After utilising it, citizens are asked to express their happiness or discontent with a service. The current analysis verifies the previous studies' findings that there is a significant and positive association

between the actual use of e-government and user satisfaction (Idoughi & Abdelhakim, 2018; Karkin & Janssen, 2014). As a result, it will be impossible to know how satisfied individuals are with e-government services until they utilise them.

The findings also showed that the use, satisfaction and PVES were significantly impacted by the quality dimensions. The implications of this, support earlier findings on the importance for the government to maintain the modernization of digital services to make them more user-friendly by creating better, interactive, and responsive websites and providing citizens with sufficiently clear information. In order to maintain continuous use and citizen satisfaction, the service interface should be improved rather than returning to the traditional method of service delivery.

The findings of this study have a wide range of implications for theory and practice. First, this study attempted to comprehend the underlying requirement for efficient and successful e-government deployment to ensure environmental sustainability. Theoretically, the DeLone and MacLean IS Success model was put to test by this study thereby making a substantial contribution to the model's development and confirmation. E-government's net benefits were assessed using the PVES. Although, in this case, employing the PVES as the net benefits of an information system is scarce. However, it is intended to shift e-government success studies away from traditional and financial measurements and toward a collection of non-financial estimates.

### **Conclusion, Limitations and Suggestions for Future Studies**

Therefore, it is reasonable to draw the conclusion that this research adds to previous studies by supplying more information about the connection between PVES and e-government. Therefore, it can be concluded from this study that an effective and efficient e-government system will positively affect environmental sustainability. Although this study's results are promising and valuable, however, there are limitations to its generalisations. First, this study adopted the PVES as the dependent variable, which is rare and new to e-government success assessment. Therefore, the theoretical support for the hypotheses generated still needs more empirical support. Secondly, the research sample is limited to Nigeria, a developing country. Here, e-government use is lower compared with high-income countries with technology and policies to influence greater e-government use among the people. It is encouraged that future research verify whether these findings can be generalized to developed countries, particularly those that use e-government extensively.

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