Factors Influencing the Adoption of E-procurement for Public Sector Works in Sri Lanka: A Case Study Analysis.

GPMCM Bandara[1#]

[1] *Department of Quantity Surveying, University College of Kuliyapitiya (University of Vocational Technology), Sri Lanka*
chathurab_priv@yahoo.com

Abstract: Public sector institutes inherently suffer from the information asymmetries, extra time and cost penalties, corruption, transparency issues, anti-competition, and too much documentation with utmost human interventions in traditional paper-based procurement practices. Recently, the Government of Sri Lanka induced public sector institutions to embrace electronic procurement (e-procurement) adoption for their procurement practices. E-procurement is revolutionary digitization of the public procurement process. Despite the potential benefits, a high percentage of public institutions as well as small and medium-scale construction companies in developing countries often slow to adopt e-procurement processes. However, its advanced applications are less prevalent even in developed countries. Hence, the study attempted to analyze the factors influencing the adoption of e-procurement for the public sector Works in Sri Lanka within the limitation of Works procurement practices of the XYZ public sector educational institute. A mixed method was used to carry out the research. At the outset, a detailed literature review was conducted and identified people, technology, internal organization, and external environment as key e-procurement adaptation variables. Moreover, three structured interviews accompanied to demystify the literature review findings concerning the Srilankan context. Finally, a detailed questionnaire survey was conducted among a population consist of 70 respondents by following the census procedure and 72.9% of them were responded. Descriptive statistics were used to analyze the data with the support of SPSS software. According to the overall result of the analysis, 'Technology' was realized as the most significant factor which considerably influenced e-procurement implementation for XYZ public sector institute in Sri Lanka.

Keywords: E-Procurement, External environment, Internal organization, People, Public sector, Technology

Introduction

Public procurement can be considered as an important tool that provides social and economic goods to the common public and its efficiency enables careful utilization of public funds (Varité Research, 2017). According to the views of Amarapathy, et al. (2013), traditional manual procurement practices are predominant in Sri Lankan public sector constructions. Conventional work practices in line with traditional procurement processes related to Works contracts often experiencing information asymmetries (Pozin and Nawi, 2016), high administrative and transaction cost, anti-competitive practices (Varité Research, 2017), risks in scams, and corruptions (National Procurement Commission, 2018), too much documentation and paper works (Singh, 2008), disintegrate institutional processes (Kong and Gray, 2006) and extra time consumption (Liyanage, 2005). As stated by Varité Research (2017), public sector procurement also suffers from similar nature drawbacks though the government of

Sri Lanka spent approximately 5.3% of Gross Domestic Product through public procurements.

Moreover, the 2016 Auditor-General Report of XYZ institute, a regional level public sector educational institute in Sri Lanka, also exaggerates the similar issues of procurement practices followed by them. As per the report concerns, nearly 60% of the procurement actions made detrimental results to the financial and administrative functions of the institute. Therefore, the National Procurement Commission (NPC) of Sri Lanka deployed e-procurement guidelines to their recently drafted National Procurement Manual by considering the drawbacks of traditional paper-based procurement practices of Sri Lankan public sector institutions (NPC, 2018).

E-procurement, as a subsection of e-commerce (Whiteley, 2001), can be considered as a prime feature of e-government processes which produce an automation for a company's procurement of goods and services directing for attaining transparency, efficiency, effectiveness, dematerialization and improve competition through the procurement process activities (Gardenal, 2013). Despite such positive results, e-procurement is not yet common even among developed nations and often experience very low-level adoption among developing countries in the South Asian region during the past decade (United Nations, 2013). Sri Lankan public sector institutions also dragging behind in the adoption of e-procurement applications (Rajasooriyar and Perera, 2016). Also, e-procurement applications are comparatively low in the construction industry compared to other industries (Shukla et al., 2016). Therefore, public construction organizations may require a detailed assessment of these key adoption factors before any e-project initiation, since e-government projects may

largely impact developing countries and often result in failures (Choi et al., 2016).

However, there is a substantial gap in identifying the factors influencing the adoption of e-procurement strategies for public sector institutions that handle construction Works. Therefore, the objective of this paper is to identify and analyze the factors influencing the adoption of e-procurement for public sector Works in Sri Lanka subjected to the limitations of XYZ public sector educational institutes & the minor construction Works handled by them.

Public sector Works procurements in Sri Lanka

According to the National Procurement Commission (2018), Works can be denoted as construction allied activities such as the construction of buildings, highway, bridges, harbor, etc. Hence, the public sector Works procurement process is the process used by government entities to acquire Works from external sources for their construction activities (National Procurement Commission, 2018).

As observed by Testa et al. (2012), there are distinct features between regional level and state level procurement handling. One such difference is the limits of authority assigned for different procurement committees. If a public procurement entity follows the National Competitive Bidding procedure in Sri Lanka, the limit of the authority vested on the Regional Procurement Committee is well within the scope of 10 Million rupees (National Procurement Commission, 2018). Hence, Rs. 10 Million is the conferred financial limit assigned for XYZ institute to handle the procurement of Works.

The government of Sri Lanka upholds a legislative framework through the updated procurement manual aiming to establish proper e-government procurement

mechanisms for public sector institutions with the support of information technology. (National Procurement Commission, 2018).

Key concerns on e-procurement adoption factors

The complex nature of the construction procurement due to excess stakeholder engagements and variance in project location influence the categorization of public sector e-procurement adoption factors (Eadie et al., 2010, cited in Laryea et al., 2014). Despite the fact of identifying key categorization factors, Amarapathy et al. (2013) denote the causes: uncertainty to the legal position, poor Information Technology (IT) infrastructure, costly IT system applications, lack of e-procurement knowledge of staff and their technical skills, indistinct supplier integration, cultural issues such as resistance to change and poor leadership and security issues as key areas to be a concern on e-procurement implementation. Moreover, obstacles concerning cultural, IT Infrastructure, security, legal, compatibility, personnel, and economic dimensions are predominantly influenced for e-procurement implementations (Laryea and Ibem, 2014 and Al-Yahya and Panuwatwanich, 2017). Despite the different classification of web-based technology applications in construction procurements into usage risk, cultural leakages, and tool leakages, Afolabi et al. (2018) also held similar views. Unlike other authors, Nawi et al. (2017) exaggerate the impact of changes in a political, economic, and technological context, inadequacy in government policies and legislations, inter-organizational barriers, and lack of standards as external environment challenges for e-procurement adoption in the Malaysian public sector constructions. However, Gunawardhana and Karunasena (2016) prevail on the same issues to identify the gaps in public procurement practices in Sri Lanka. Moreover, high initial cost, lack of

required finance, poor integration with stakeholders, difficulties for technological adaptation with existing IT infrastructure, Inadequate business processes to support e-procurement implementation, poor management support, and cultural issues can be considered as organization related obstacles which affect the slowness of e-tendering adaptation in addition to the people-centered barriers such as resistance to change, lack of electronic application knowledge and training, negative attitudes of top managers (Addison, 2016). These findings have been extended with the external environment barriers such as inadequate e-procurement solutions in the market, lack of standards, and poor supplier relations (Mukhongo and Aila, 2018). However, strong economic and political commitment is required to overcome the e-procurement implementation barriers in the Sri Lankan context (Amarapathy et al., 2013).

Tran et al. (2011) attempt to evaluate the role of the government, organization, and individuals for improving the e-procurement implementation readiness level of the construction organizations of developing countries and conclusively develop a readiness model in terms of Government, Organization, and Technology factors. Choi et al. (2016) also exaggerate the similar views and proposed Strategy, Technology, Organization, People, and Environment (STOPE) e-procurement adoption framework supported by case analysis in Indonesia. Though Tran et al. (2011) omit people-related factors at the conclusion; Arunga and Paul (2017) considerably appreciate the requirement of effective human service delivery other than their technical skills and ethical practices of public sector individuals towards e-procurement adaptation. However, the ultimate result has shown that the technological infrastructure including software, hardware, networking, and interoperability significantly influences

e-procurement implementation of the public sector (Arunga and Paul, 2017).

E-procurement adoption factors and indicators

The number of e-procurement adoption factors addressed by various authors can be suppressed into technology, external environment, organization, and people related categories. Overall literature review outcomes of factors and indicators related to each adoption factor can be summarized as in Table 1.

Table 1. E-procurement adoption factors and indicators

Key Factors and Indicators	Citation
1. People	(Choi et al., 2016 and Alyahya, 2017)
1.1 Nature of staff adaptation to change	(Amarapathy et al., 2013; Laryea and Ibem, 2014; Addison, 2016; Al-Yahya and Panuwatwanich, 2017 and Mukhongo and Aila, 2018)
1.2 E-procurement knowledge of the staff	(Amarapathy et al., 2013; Laryea and Ibem, 2014; Addison, 2016; Al-Yahya and Panuwatwanich, 2017 and Mukhongo and Aila, 2018)
1.3 Technical expertness of staff	(Amarapathy et al., 2013; Laryea and Ibem, 2014; Addison, 2016; Al-Yahya and Panuwatwanich, 2017; Arunga and Paul, 2017 and Mukhongo and Aila, 2018)
1.4 Accountable service deliveries	(Addison, 2016; Arunga and Paul, 2017 and Mukhongo and Aila, 2018)
1.5 Ethical practices	(Arunga and Paul, 2017)
2. Technology	(Addison, 2016; Choi et al., 2016; Alyahya, 2017; Arunga and Paul, 2017 and Mukhongo and Aila, 2018)
2.1 Software applications	(Afolabi et al., 2017; Alyahya, 2017 and Arunga and Paul, 2017)
2.2 Hardware applications	(Afolabi et al., 2017 and Arunga and Paul, 2017)
2.3 Network applications	(Afolabi et al., 2017; Alyahya, 2017 and Arunga and Paul, 2017)
2.4 Interoperability capacity of existing IT infrastructure	(Addison, 2016; Afolabi et al., 2017; Alyahya, 2017; Arunga and Paul, 2017 and Mukhongo and Aila, 2018)
2.5 Assurance for digital security & authentication	(Amarapathy et al., 2013; Laryea and Ibem, 2014; Addison, 2016, Al-Yahya and Panuwatwanich, 2017 and Mukhongo and Aila, 2018)
3. Internal Organization	(Tran et al., 2011; Choi et al., 2016 and Alyahya, 2017)
3.1 Institutional structure	(Alyahya, 2017)
3.2 Institutional culture	(Addison, 2016; Afolabi et al., 2017; Alyahya, 2017 and Mukhongo and Aila, 2018)
3.3 Policies and procedures of the institute	(Alyahya, 2017)
3.4 Organizational readiness for capacity development	(Alyahya, 2017)
3.5 Financial ability of the institute	(Addison, 2016 and Mukhongo and Aila, 2018)
4. External Environment	(Tran et al., 2011; Choi et al., 2016; Alyahya, 2017 and Nawi et al., 2017)
4.1 Government leadership	(Tran et al., 2011; Amarapathy et al., 2013; Laryea and Ibem, 2014; Al-Yahya and Panuwatwanich, 2017 and Nawi et al., 2017)
4.2 Current IT management strategy	(Alyahya, 2017 and Nawi et al., 2017)
4.3 Status of the legal and regulatory framework	(Amarapathy et al., 2013; Laryea and Ibem, 2014; Al-Yahya and Panuwatwanich, 2017; Nawi et al., 2017 and Varité Research, 2017)
4.4 Financial support	(Amarapathy et al., 2013; Addison, 2016; Nawi et al., 2017 and Mukhongo and Aila, 2018)
4.5 Stakeholders readiness level to work with e-procurement	(Amarapathy et al., 2013; Laryea and Ibem, 2014; Addison, 2016; Al-Yahya and Panuwatwanich, 2017; Nawi et al., 2017 and Mukhongo and Aila, 2018)

Research Methodology

The research methodology consists of research design and research methods that utilize principles and techniques required to achieve the research objectives. To support XYZ case study based research data analysis, a mixed method was used to obtain data. By improving the validity of variables, a preliminary interview can be considered as

an applicable way to discover the user behaviors and expert opinions for a particular subject area (Creswell, 2013). Therefore at the outset, three preliminary structured interviews were carried out among three specialists who have more than 10 years of experience and awareness in the procurement, construction, and IT sectors. Preliminary interviews aimed to demystify the literature review findings in line with the Srilankan context. Interviewees were desperately in line with the literature findings with special considerations on accountable services and ethical practices as people related indicators.

When researchers make aware of what precisely requires measuring the variables and what type of information is essential, questionnaires are the most effective data collection instruments (Sekaran and Bougie, 2010). Hence, a self-administrative questionnaire was also developed and piloted among three public sector procurement specialists. As a result of their responses, some questionnaire statements were amended before the detailed survey. The main research instrument for the study, the paper-based questionnaire, entailed with two main sections. The first section was confined to extract general demographic aspects and procurement awareness of the respondents. The second section was made-up with 20 items related to 4 different e-procurement adaptation factors, namely; People, Technology, Internal Organization, and External Environment. A five-point Likert scale was adopted to articulate a scale for the questionnaire statements in the second section. The degree of influence was obtained through the Likert scale ranged from Not at all influential = 1, to Extremely influential = 5. For analytical justifications, the mean value of the degree of influence below 2.50 was considered as a value of 'least influential'. Correspondingly, the mean value between 2.50 to 3.50 was considered as

'somewhat influential', and the mean value above 3.50 was occupied as 'high influential' value by following a similar strategy occupied by Ibem et al. (2017).

'Census' is an attempt to collect data from the total population when the target population is limited in the selected study region (Jupp, 2006). The total population for this study encompassed with a census population of 70 numbers of respondents who representing top management (management board level), middle management (executive level), bottom management (management supportive level), and other supporting staff levels who were predominantly aware of various procurement activities of XYZ public sector institute. 72.9% of the total population was responded as shown in Table 2.

Table 2. Response rates in line with occupational levels of XYZ public sector institute

Occupation Level	Target Population	Responded Population	Response Rate
Top Management (Board) level	14	11	78.6%
Middle Management (Executive) level	27	23	85.2%
Bottom Management (Assistant) level	19	14	73.7%
Other supportive staff level	10	03	30%
Total	70	51	72.9%

Findings of the empirical study were compared with the literature outcomes and overlay factors were considered as critical influential factors for e-procurement adoption.

Results and Discussion

People as an adoption factor of e-procurement

In the first instant, respondents were requested to select the level of influence for

people related indicators. As per the tabularized results in Table 3, the majority of the respondents indicated 'Accountable service deliveries' with 3.88 mean (> 3.50) highly influence the effectiveness of e-procurement implementation and it was 60.8% of proportionate responses. Besides, 52.9% of respondents deliberately chose that 'staff adaptation to change' (mean > 3.50) as an e-procurement implementation factor with high influence whereas the results showed 39.2% agreed responses for the moderate influence of 'e-procurement knowledge of the staff'. Moreover, 37.3% of the responded population agreed with the moderately influential nature of 'technical expertness of the staff' (mean = 3.08) while 39.2% settled with 'ethical practices' (mean = 2.92) as a moderately influencing indicator for successful e-procurement implementation.

Table 3. Indicators of people factor

No	Indicator	Mean value
1	Accountability	3.88
2	Staff adoption to change	3.65
3	E-procurement knowledge	3.10
4	Technical expertness	3.08
5	Ethical practices	2.92
Average		3.33

Technology as an adoption factor of e-procurement

Secondly, respondents were requested to indicate to what extent did technology influences e-procurement implementation regarding the selected case study. Results stated in Table 4 responsively showed that the majority of respondents (78.4%) settled with the statement that 'software application' (mean > 3.50) highly influences e-procurement adaptation in the studied institute. Moreover, 76.5% and 74.5% of

respondents highly agreed with the significant influence of 'hardware applications' and 'network applications' (mean > 3.50) for e-procurement applications respectively. Similarly, the results indicated a higher influence of 'interoperability capacity of existing IT infrastructure' (mean > 3.50) on effective e-procurement adaptation with a high respondent percentage of 62.7%. However, 41.1% majority believed that 'assurance for digital security and authentication' (2.5 ≤ mean ≤ 3.5) was just a moderately influencing e-procurement application indicator belong to the technology factor.

Table 4. Indicators of the technology factor

No	Indicator	Mean value
1	Network application	4.06
2	Hardware application	4.04
3	Software application	4.02
4	Interoperability capacity of current IT infrastructure	3.51
5	Assurance for digital security	2.86
Average		3.70

Internal environment as an adoption factor of e-procurement

Thirdly, there was a need to identify the influence of internal organization factors on e-procurement adaptation. Hence, a frequency chart was generated and the mean value results can be revealed as in Table 5.

Findings indicated that the majority of respondents (68.7%) forecasted high influence for the 'financial ability of the organization to apply new technologies on successful e-procurement implementation' (mean > 3.50). However, there was a moderate response rate (52.9%) for the influence of 'organizational policies and procedures associated with the public institute' on e-procurement applications.

However, 56% of respondents believed that 'organization structure' will not necessarily influence e-procurement implementation with the received mean value between 2.5 and 3.5. Correspondingly, the 'cultural influence of the organization' for its e-procurement implementation was not reaching a higher margin since the 35.5% of respondents only affirmed its moderate influence over e-procurement application by attaining a moderate mean value. Furthermore, 47.1% of respondents somewhat believed that e-procurement implementation was influenced by the 'organization's readiness for capacity development' to a certain extent.

Table 5. Indicators of internal environment factor

No	Indicator	Mean value
1	Finance management ability within the institute for new applications	3.92
2	Internal policies & procedures	3.27
3	Organizational readiness for capacity development	3.06
4	Institutional culture	2.86
5	Institutional structure	2.53
Average		3.13

External environment as an adoption factor of e-procurement

The fourth and the last e-procurement adaptation factor identified by the researcher was the external environmental factor. The study specified the extent of external environmental indicators' influence on e-procurement implementation as demonstrated in Table 6.

According to the findings, 74.5% response on 'financial support afforded by the government', 64.7% response on 'IT management strategy of the government', and 58.8% response on the 'legal and regulatory framework', respectively epitomized each factor as a highly influential factor which considerably influences e-procurement adoption in the selected public institute. Although, 41.2% proportion of respondents conceived that 'external stakeholders' readiness level to work with e-procurement' may not substantially influence e-procurement adaptation, 54.9% of respondents believed 'government leadership' (2.5 ≤ mean ≤ 3.5) was somewhat influential for successful e-procurement adoption.

Table 6. Indicators of the external environment factor

No	Indicator	Mean value
1	Financial support afforded by the government	4.16
2	Government's legal & regulatory framework system applications	3.59
3	Government's IT management strategy	3.57
4	Government leadership (Ministry level) for new system applications	3.39
5	External stakeholder readiness to work with e-procurement	2.67
Average		3.48

As a measure of central tendency, 3.33 mean value was obtained from the responses made by the participants on 'people factors'. This mean value positioned between 2.5 and 3.5 revealed that people somewhat influential for effective e-procurement adaptation.

The 'technology factor' was the central variable that could perhaps be explained with the reviewed observation consists of a high average mean value (> 3.50). Acquired average mean value (3.70) proved the highly influential nature of technology as an effective e-procurement implementation factor.

The study further demonstrated an 'internal organization' as a factor of comparatively low influential nature than other revealed factors that affect successful e-procurement

implementation. Since the average mean value was 3.13, the internal organization was somewhat influential for effective e-procurement applications.

The external environment factor was the second largest factor demonstrates a high average mean value (3.48). Though that mean value, as a measure of central tendency, was closure to the high mean value range, it can only be considered as somewhat influential for effective e-procurement adaptation. However, the external environment influenced e-procurement adaptation more than the people and the nature of the internal organization of the XYZ public sector institute.

Conclusions

The study identified four adaptation factors; people, technology, internal organization, and external environment, which possibly influence e-procurement implementation. Concerning the limits of the XYZ public sector institute, technology was the only factor that made a significant influence on the e-procurement adoption in public sector Works procurement processes in Sri Lanka. Hence, the expansions in software, hardware, and network application and their secured interoperable capacities possibly generate value addition to public sector Works procurement processes in Sri Lanka.

The young population engaged with the institute may induce this positive response for technology in response to their level of interest towards technological enhancements. Therefore, further researches need to be carried out by diversifying the research context with more public sector institutes having different financial authorities and by adding new factors and indicators (constructs) to generalize the findings.

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Acknowledgments

Author Biography

G.P.M.C.M. Bandara is a Masters in Quantity Surveying degree holder at Birmingham City University, United Kingdom. He is currently serving as the internal academic coordinator of the Department of Quantity Surveying at the University College of Kuliyapitiya (University of Vocational Technology).