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Process Improvement Hypothesis Testing in an e-Procurement Implementation Assessment Model Framework: A Case Study of Bangladesh's Roads and Highways Division

Md. Abdur Rashid[1, 2] and Mohammad Shorif Uddin[3]

[1] National Academy for Planning and Development, Bangladesh

[2]Centre for Higher Studies and Research, Bangladesh University of Professionals, Bangladesh

Corresponding Author: rashid.eee.cse@gmail.com, ORCID iD: 0000-0001-8311-2363

[3] Department of Computer Science and Engineering, Jahangirnagar University, Bangladesh

shorifuddin@gmail.com, ORCID iD: 0000-0002-7184-2809

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ABSTRACT: *Using the policy tools PPA-2006 and PPR-2008, the use of manual tendering by public procurement agencies has traditionally been continues in Bangladesh. But it had some challenges in terms of process improvement. The e-Government Procurement (e-GP) guideline 2011 is adopted to address this issue and lunched e-GP system in public procurement. However, since the e-GP system was first implemented, a great deal of investigations or analyses have not been conducted to determine how well its tender process improvement is being assessed. This study aims to investigate the essential variables that contribute to the successful implementation of an electronic procurement system in Bangladesh. Another goal is to build an efficient e-procurement implementation assessment model. Survey questionnaires were employed to collect data from eleven zones in Roads and Highways Division (RHD) as a population. The study sample size was 206 Procurement Entities (PE) engineers. Hypothesis test has been done choosing MLR model using SPSS software. Process improvement was one of the eight hypothesis tests in the study. The results demonstrated that the model was fit. Academicians, students, e-GP users, procurement professionals, and researchers will benefit from the study's findings. The study's original contribution is the creation of a theoretical design for the RHD e-procurement implementation assessment model.*

KEYWORDS: e-GP guideline 2011, e-Procurement assessment model, hypothesis test, e-procurement, process improvement, procurement entities.

INTRODUCTION

The Central Procurement Technical Unit (CPTU) promulgated the Public Procurement Act 2006 (IPPA 2010) and the Public Procurement Rules 2008 to create a sufficient legal

framework. Following that, Bangladesh used the old manual tendering procedure governed by the Acts and Rules. Despite this, public procurement agencies remain challenged in ensuring an efficient, free, fair, competitive, and transparent system. The manual tendering method is prone to abuse by vested interest groups due to its scope.

Based on the technological height of the electronic government procurement (e-GP) system developed and implemented by the CPTU of the Ministry of Planning, Bangladesh adopted the e-Procurement implementation (CPTU 2011) in the public procurement area in 2011. In addition, e-GP was developed in response to a World Bank recommendation (World Bank 2002) to enhance the effectiveness, credibility and transparency of all public procurement in Bangladesh. On the other hand, e-Procurement (CPTU About 2021) is a reliable web-based application platform for engaging with the bidder's community in a paperless environment free of challenges, delays, and physical insecurity (Sanewu 2016). The e-GP system is currently in use. The introduction of electronic procurement increased (Jürgen et al. 2023) Bangladesh's gross domestic product by 0.48 to 0.54 percent, or US$1.4 billion to US$1.6 billion in 2019. However, PEs and all bidders continue encountering complications, and assessments haven't been completed since the e-GP system's deployment (Akando 2016; Marcella 2006). The final goal is to forecast the critical effects of various factors impacting the deployment of e-Procurement in RHD that helped to design an e-procurement assessment model. The study implications are that academicians, students, researchers, procurement entities, and policymakers will be benefited from the findings. The ultimate goal (Becker 2018) is to conduct a KPI (key performance indicator)-based quality evaluation to identify potential flaws and difficulties in future e-tendering procedures to support and enhance future e-tendering processes.

Background of the Study

Scale of e-procurement adoption in RHD has been increased remarkably. In a policy research working paper published by world bank (Jürgen et al. 2023) explored that scale of e-procurement adoption are 0% in FY 2011-12, 5% in FY 2012-13, 37% in FY 2013-14, 100% in FY 2014-15 to FY 2017-18. The key concern is that the e-procurement assessment model had never been the subject of prior RHD studies. Hence, no e-procurement assessment model on RHD was proposed and had no hypothesis tests. On the other hand, this article reveals the result of one dependent variable *process improvement* and its related four independent variables.

The Rationale of the Study

The e-Procurement system's performance can be assessed so that obstacles and factors can be anticipated to improve the e-Procurement system further. The e-GP guideline (IMED Proggapon 2011) policy can be updated using this research findings and results. Also, using e-Procurement significantly facilitates 100 per cent excellent public procurement and safeguards its long-term sustainability. Therefore, it should assess the aspects that affect or influence Bangladesh's adoption of a successful e-Procurement system.

The study's findings will be helpful to e-Procurement practitioners. The suggested methodology will aid practitioners working in public procurement in reviewing, implementing,

and modifying their procurement framework (OECD 2016). For subsequent e-GP policy/guideline enhancement, this form of assessment data will be trustworthy, i.e. timely.

Research Question

A contemporary e-Procurement assessment model can be developed to evaluate the e-GP platform, which was deployed in 2011. As a result, the study's major research question was:
Q. What are the different factors that influence the adoption of the e-procurement implementation assessment model in RHD?

Specific Objective

Following the study question, the objectives listed below were used to develop a hypothesis and survey questionnaires.
Objective- To predict the significant effects of different factors influencing adopting the e-Procurement implementation assessment model in RHD development project procuring.

Motivation and Novelty

The motivation for the study is to theoretically design an e-procurement implementation assessment model for RHD in Bangladesh. The proposed e-procurement assessment model will help Bangladesh overcome flaws and develop a viable e-procurement system. *Process Improvement* is one of the assessment framework's dependent variable for hypothesis test.
The study's novelty is in the theoretical design of a new e-procurement implementation assessment conceptual framework and model, which has been developed for the first time in Bangladesh's RHD. In addition, a hypothesis test was performed to evaluate the model's fitness.

LITERATURE REVIEW

Theoretical Review

In the study, the contingency theory was embraced (Candela A. & Ulises F. 2022). This theory aided in putting the idea of improving organizational performance into context. Adoption of e-procurement aided process improvement in public procurement.

Empirical Review

By in-depth literature review (Rashid and Uddin 2019), researcher built a conceptual framework and pursued data appropriately using SPSS software, variables are divided into dependent and corresponding independent variables, as shown in **Table 2.1**. An organization can develop a known point of reference to better analyse its business's performance (Kevin 2016) and achieve goals by defining Critical Success Factors (CSFs). The researcher identifies various lists of CSF in the literature study that can be treated as variables to create a conceptual framework for this research.

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Table 2.1 Proposed Conceptual e-Procurement Assessment Framework

Dependent Variable	Independent Variable
process improvement	*1) workflow management;* *2) managing capacity of large number of bidders;* *3) automatic generation of necessary report ;* *4) e-contract management system;*

Data Source: Literature Review Survey, 2020

Methodology

All Procurement Entity officers of Roads and Highways Department (RHD) in Bangladesh were population. The study used survey questionnaires. The RHD PE officers were considered respondents. The scope24 of the study was four wings of RHD in Bangladesh, which are 11 zones, 31 circles, and 70 divisions. The survey's sample size 206 respondents. E-Procurement related officers in RHD were randomly selected for the survey using a stratified sampling technique. Survey questionnaires were developed following the study's objective. Quantitative data was collected from officers with a 5-point Likert scale [Scale: 1= Not Satisfied, 2= Slightly Satisfied, 3= Moderately Satisfied, 4=Very Satisfied, 5= Extremely Satisfied]. The researcher used SPSS software for analysis. Multiple regression analysis was used to show the relationship of the independent and dependent variables.

Results and Findings

Hypothesis test– Effective e-Procurement implementation assessment significantly depends on *process improvement*.

To assess the e-tender effectiveness on *process improvement* had 5 proposed variables. First, run a regression model on PE officer's data to find the effect of the four independent variables on the dependent variable *process improvement*.

Table 4.1 Bidders Respondents' Statistics of Process Improvement

	Mean	Std. Deviation	N
Process improvement	4.12	.645	206
Workflow management	4.09	.634	206
Manage large bidders	3.84	.683	206
Automatic report generation	4.02	.580	206
e-Contract management system	3.83	.718	206

Data Source: Field Survey, 2020

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Table 4.1 shows that the total number of PE officers who responded was 206. The mean value and the standard deviations of the five variables are also seen in **Table 4.1**.

Table 4.2 Model Summary of Correlation on Process Improvement

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.921[a]	.849	.846	.253	.849	282.550	4	201	.000

a. Predictors: (Constant), e-Contract management system, Workflow management, Manage large bidders, Automatic report generation
Data Source: Field Survey, 2020

The model summary **Table 4.2** provides the value of R and R^2. The R-value represents the simple correlation of 0.921, which indicates a degree of correlation. Therefore, the Analysed correlation value is 92.1%, indicating a positive strong correlation coefficient.
The R^2 value indicates 84.9% of dependency can be explained. Therefore, the R^2 value of the above model summary, **Table 4.2**, concludes that the dependent variable '*process improvement'* has 84.9% depend upon 4 independent variables.

Table 4.3 Regression Fit Test (ANOVA) on Process Improvement

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	72.339	4	18.085	282.550	.000[b]
	Residual	12.865	201	.064		
	Total	85.204	205			

a. Dependent Variable: Process improvement
b. Predictors: (Constant), e-Contract management system, Workflow management, Manage large bidders, Automatic report generation
Data Source: Field Survey, 2020

From the ANOVA **Table 4.3** (sig=.000; sig value <.005) H_o is rejected. So, the regression model predicts the dependent variable *process improvement* significantly. So, overall regression significantly influences increasing process improvement by four independent variables that can be used to predict *process improvement* reliably.

DISCUSSION OF THE FINDINGS

The Analysed correlation value R reveals 92.1%, indicating a high correlation (Evans 1996) coefficient (positive strong). The R^2 value reveals the dependent variable '*process improvement'* has 84.9% depend upon four independent variables. The sig value is 0.00, which

is less than the p-value. So, H_a is accepted. So, the regression model is significant and statistically fit. According to the test result described above, *process improvement* is vital for a successful e-Procurement implementation assessment.

CONCLUSION

The RHD has been one of the largest public procurement departments of using the e-GP system in Bangladesh since 2011. This is why it was chosen all PE officers as population. Following the research methodology, survey questionnaires and hypotheses were established with study proposal objectives in mind.

The researcher suggested a conceptual framework based on the critical literature assessment and research gap analysis. Dependent variable *process improvement* in this conceptual framework had 4 independent variables. The hypothesis was evaluated individually in the study. The hypothesis test's major conclusion was that H_o (null hypothesis) was rejected and

H_a (alternative hypothesis) was accepted. As a result, it has been concluded that process improvement is the factor in assessing effective e-procurement.

Conflicts of Interest: The authors declare no conflict of interest.

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