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Cost and Time Efficiency Analysis of Manual and e-Procurement Systems in Roads and Highways Department: Tender Advertising Issue Perspective

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ABSTRACT: *Public procurement is a vital process to procure goods, works and services, ensuring accountability that ensures cost and time-savings. Roads and Highways Departments (RHD) is a big department chosen as a target population for this study. All RHD Procurement Entities (PE) use manual and e-procurement tendering systems. However, cost and time reduction is a considerable barrier to RHD procurement. The manual tendering procedure is costly and time-consuming since it requires big-size tender advertisements in print media like daily papers. In RHD, however, no comparative analysis of the efficiency in the cost and time context of tender advertising has been explored. Therefore, using a stratified sampling method, the RHD's e-Procurement-related PE officers were chosen as a sample. The mean value of advertisement cost and time of the e-tender system and the manual tender system as a continuous normally distributed variable was utilized to compare two groups using the independent samples t-test model. The study's novel contribution is the comparison of efficiency in terms of cost and time context between two sets of manual and e-tender advertisements. According to the survey results, the e-procurement system showed lower cost and time involved in the tender advertising comparing manual tender. The results will also aid academicians and students and improvements to e-GP policy standards.*

KEYWORDS: e-GP system; Efficiency; t-test; Cost-saving; Time-saving; e-procurement; RHD; Manual tender

INTRODUCTION

The Central Procurement Technical Unit (CPTU) of the Ministry of Planning in Bangladesh has been developing and managing the e-Procurement system in public procurement since 2011. The World Bank (World Bank 2002, ADB 2018) recommended that the e-GP be used to

improve efficiency, transparency, fairness, and competitiveness in all public procurement. In FY20, US$17.5 billion of procurement contracts representing about 62 percent of public procurement expenditure (Worl Bank 2021) in Bangladesh, were processed through the e-GP system.

The intention of tender advertisements (Asif and Nisar 2016) is to inform suppliers and vendors of the goods and services a public institution needs to purchase. One of the significant and costly forms of tender advertisement in print media. The size of the advertisement in print media is another crucial consideration. The government's spending on tender advertisements can be decreased by utilizing contemporary technologies, such as e-procurement.

Background of the Study

The e-GP system has been operational in Bangladesh since 2011. However, the issue is that bidders, procurement entities, and other stakeholders are considering knowing the efficiency of the e-GP system's cost and time contexts. What is the cost and time effectiveness of the e-GP system? What benefits would the nation derive from the most recent creative technique, such as the e-GP system? Compared to a manual tendering system, are there any cost-savings (Enock Musau 2018) of e-procurement? The factors (Onosakponome, Yahya, Shima, Rani, and M. Shaikh 2011) to be addressed in the e-procurement system is the ideal solution in terms of cost, time, and quality. There is a lack of such literature comparing advertisement costs between manual and e-procurement tendering in RHD.

Motivation

The level of interest in this study topic is the comparison of the tender advertisement costs and time associated with manual and electronic tendering processes. Another advantage of the topic is that it dramatically impacts public money savings regarding tender advertisements. Therefore, the public procurement entities (PEs) will be motivated to adopt and complete 100% (SFYP 2015) of their transactions using the e-procurement system.

Research Questions

Three research questions are developed in support of the study while keeping in mind the whole of the research on the subject:

Q. *How to compare the procurement efficiency between manual and e-procurement purchases in the context of the RHD development projects.*

Research Objectives

To answer the research's central question and achieve its study objective is-

1. *To compare the procurement efficiency between traditional and e-Procurement purchases of the RHD development project.*

RELATED LITERATURE

Following the Public Procurement Rules 2008 clause 90 (1) (Ka), all manual tender (CPTU 2021) advertisements are published in `one reputed English and one Bengali daily newspaper.

The tender advertisement is usually bigger and more expensive to publish in the daily newspaper. On the other hand, tender advertisement cost in the e-procurement system is (CPTU 2011) cheaper. In the e-advertisement, PE prepares all tender documents in the online e-GP system dashboard. All detailed information relating to e-tenders advertisements is available online (CPTU e-tenders 2022), where bidders can read and search for e-advertisement.

RESEARCH METHODOLOGY

This article answers the second objective of the research and is based on the field data analysis and findings.

Population and sample size

The study population was RHD in Bangladesh. The sampling technique was multistage. A stratified (Asenahabi 2019) and simple random sampling technique was used to select respondents. The research was conducted in 4 wings and 11 Roads and Highways Divisions (RHD) zones in Bangladesh. The total sample size of this research was 402 PE officers and bidders of RHD in Bangladesh. Among them, 83 PE officers from RHD responded to this survey questionnaire, comparing the context of tender advertisement costs and time.

Methodology

Primary quantitative data related to this article have been collected using survey questionnaire methods from RHD PE officers. The study was done utilizing structured questionnaires. In addition, an Independent sample t-test model was used to compare the manual tender advertisement cost and time with the e-procurement system.

RESULTS AND DISCUSSION

a) Comparison of tender advertisement efficiency in the cost context

Test variables, i.e. two independent variables are: *The group means of the manual, and E-tender advertisement costs are compared.*
Considered,
Null hypothesis H_0: $\mu_1 = \mu_2$
Alternative hypothesis H_a: $\mu_1 \neq \mu_2$
μ_1 = population means for *e-tender advertisement cost*
μ_2 = population means for *manual advertisement cost*
Significance level $p=\alpha = 0.05$
Confidence interval level = 95%

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Table 4.1 Summary Statistics for comparing advertisement cost

	Tender Type	N	Mean	Std. Deviation	Std. Error Mean
Taka	Etender	83	20600.96	15472.977	1698.380
	Manual	83	26826.51	19721.519	2164.718

Source: Researcher's Field Survey, 2020

Data findings of group statistics **Table 4.1** shows that average advertisement cost, i.e. mean value for e-tender cost and manual system cost, is correspondingly Taka 20600.96 and Taka 26826.51, respectively. The study results revealed that the present e-tender system advertisement cost is lower than that of the traditional manual tender system.

Table 4.2 Test for comparing advertisement cost between e-tender and manual tender

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Taka	Equal variances assumed	6.1	.014	-2.26	164	.025	-6225.542	2751.5	-11658.383	-792.7
	Equal variances not assumed			-2.26	155.2	.025	-6225.542	2751.5	-11660.670	-790.4

Source: Researcher's Field Survey, 2020

But from the Independent Samples T-Test **Table 4.2**, we observed from Levene's test that the F value is 6.143 & its Sig. value is 0 .014. Here, sig value (.014) < than p-value (0.05) i.e. which is highly significant. This refers to equal variances not assumed here and relies on the second row of output. From the second row, t = -2.263, negative, left tailed & the Sig. = 0.025/2=.0125. Here, the sig value is less than the p-value, which is significant. This indicates that the Null hypothesis H_0 is rejected & alternative hypothesis H_a is accepted, i.e. $\mu_1 \neq \mu_2$. This states that the average cost of an e-tender advertisement is not equal to that of a manual advertisement.

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b) Comparison of tender advertisement efficiency in the time context

Here, the Tests, i.e. two independent variables, are:
Manual advertisement time and *E-tender advertisement time*
Considered that
Null hypothesis H_0: $\mu_1 = \mu_2$
Alternative hypothesis H_a: $\mu_1 \neq \mu_2$
μ_1 = population means for advertisement cost for e-tender
μ_2 = population means for advertisement cost for manual tender
Significance level $p=\alpha = 0.05$
Confidence interval level = 95%
T-Test result

Table 4.3 Comparing Advertisement Time by Mean

	Tender Type	N	Mean	Std. Deviation
Days	Etender	83	3.94	6.984
	Manual	83	8.01	7.029

Data Source: Field Survey, 2020

The mean time of an advertisement is 3.94 and 8.01 days, according to **Table 4.3**. The duration of the e-tender advertisement is thus shown to be lower than that of the manual advertisement.

Table 4.4 Comparing advertisement time between e-Tender and manual tendering

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.		df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Days	Equal variances assumed	.028	.867	-3.7	164	.000	-4.071	1.088	-6.218	-1.923
	Equal variances not assumed			-3.7	163.9	.000	-4.071	1.088	-6.218	-1.923

Data Source: Field Survey, 2020

Table 4.4 shows the F value to be.028 and its Sig. value to be 0.867, which is higher than the p-value. Therefore, it is not significant. This shows that the assumption of equal variances and reliance on the first row of output are present here. It is noteworthy since the first-row Sig value

is 0.000, which is less than the p-value. Therefore, the H_a is accepted. So, $\mu_1 \neq \mu_2$. This indicates that the typical length of an e-tender advertisement differs from a typical length of a manual advertisement.

CONCLUSIONS

The study compared the time and costs associated with manual versus e-procurement processes to examine the efficiency of public procurement. The researcher collected primary data from PE officers of RHD in Bangladesh. The data was processed using the independent sample t-test model using the SPSS software. Using data, the researcher compared the procurement efficiency of manual and e-Procurement purchases of RHD public procurement in a cost and time context. Based on the findings and analysis, it can be said that e-procurement requires a lower average tender advertisement cost than manual tendering. Additionally, it is established that e-procurement requires less time on average for tender advertisements than manual bidding. As a result, RHD in Bangladesh was able to cut back on advertising costs and time due to the use of e-procurement.

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

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