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Efficacy Of Public-Private Partnership Procurement Framework On The Implementation Of Energy Infrastructure Projects In Kenya

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Abstract: The study examined the efficacy of public-private partnership procurement framework on the implementation of energy infrastructure projects in Kenya. The study was motivated by the fact that while public-private partnerships have gained popularity in the recent past, there has been limited empirical research on their performance, particularly in terms of their impact on project implementation in terms of time, cost, and project outcomes in developing economies. The study's target population of the study were the key personnel / staff of the electricity projects implementing corporations under the ministry of energy, Energy and Petroleum Regulatory Authority, Ministry of Energy, the National Treasury, 7 tier 1 commercial banks and 6 development partners. A census approach was adopted. The study found procurement framework has adverse effect on project implementation time, cost and outcome. This suggests that the PPP procurement process in Kenya is lengthy and requires streamlining to expedite project execution.

I. INTRODUCTION

Public–private partnerships (PPP) have been widely used to deliver large infrastructure projects in the world given huge financial resources associated with them. In the recent past, PPP strategy has become a crucial financing mechanism for the public infrastructural projects amid the dwindling government financial resources. Therefore, governments across the world have considered PPPs as a key financing strategy in the wake of limited public financial resources. The governments in the developing economies are gradually embracing the PPPs mechanism given the competing financial needs between the recurrent budget and the development budget financing. However, while PPPs have gained popularity in the recent past, there has been limited empirical research on their performance especially regarding time and cost of project implementation with the gap being more expounded in the developing economies. This study addresses this gap in the empirical literature.

The commonly applied definition of the PPPs is a long-term agreement between the government and a private partner(s) whereby the private partner undertakes to provide services to the public on behalf of the government for stipulated return (OECD, 2018; World Bank, 2018). Globally, PPPs have witnessed unprecedent growth over the past decades majorly in the provision of capital-intensive infrastructural projects. Indeed, the popularity of the PPPs has risen since 1980s (Mital, 2016). The recent growth in PPPs is underpinned on the growing infrastructure financing gap in the context of narrowing fiscal space to support any debt financing on the government side.

Global review of PPPs portfolios reveals that they have tremendously grown over the years with the private sector participation in PPP infrastructure projects and investment commitments rising to a high of above USD 400 billion by the year 2022 (World Bank, 2022). This represents 41 percent rise in the private sector participation in PPP infrastructure projects and investment commitments between 2017 to 2022. The African Development Bank reports that the PPPs investment in Africa have substantially grown with time

attaining a high record of approximately USD 130– 170 billion as at 2018. Consequently, the financing gap has increased from USD 68–108 billion between 2015 to 2018 (African Development Bank, 2018). Globally, the status of the private participation in the PPPs reveals that between the year 1991 and 2015, private participation has been on a setback especially in the developing economies. In particular, 259 PPP projects out of a total of 6,273 PPP projects have been cancelled while 67 projects been classified as under distressed. This performance warrants the need for a holistic examination of PPP framework efficacy.

An effective PPP procurement framework is key in PPP projects implementation. From the literature perspective, several empirical studies have been conducted regarding the critical success factors in so far as PPP procured projects implementation are concerned. In Indonesia, Atmo et al (2017) finds that PPP procured projects were completed on time compared to projects procured via traditional model. However, on the contrary, no significant differences in project cost outlays were noted between PPP procured projects and projects procured via traditional model.

II.LITERATURE REVIEW

Chasey, Maddex and Bansal (2012) compared the PPP procured projects versus traditionally procured projects in the road sector in North America. The study establish that PPP procured projects recorded cost overruns of 0.81 percent on average compared to traditionally procured projects whose cost overruns were 1.49 percent for traditionally procured projects. This indicated that PPP procured projects were more cost efficient. Chan et al (2010) assesses the reasons behind the success of PPP projects in China and finds that among other factors, a transparent and efficient PPP procurement process supported by a comprehensive PPP procurement framework was a prerequisite for the PPPs to work in the provision of physical infrastructure in China. Osei-Kyei and Chan (2015) reports that a clear PPP procurement framework is core in promoting competitive bidding. Similar evidence is reported by Sawalhi and Mansour (2014) and Liu et al. (2015). Further, the importance of PPP procurement framework is underscored by Soomro and Zhang (2015) who asserts that PPPs procurement process is a major determinant of their success.

Eberhard *et al*, (2016) analysed independent power projects in African countries with the key focus on South Africa, Kenya, and Nigeria and finds the crucial role of procurement in the PPPs success. Notably, the study finds that well-designed procurement process for the PPPs, competitive bidding and the flexibility in the design of subsequent bid rounds significantly determine the energy sector PPPs success. Moreover, World Bank (2018) asserts that a competitive and transparent procurement processes is very crucial for successful closure and implementation of a PPPs. Similar findings are reported by Gail et al (2023) who assert that a PPP procurement that fall short of transparency and accountability is detrimental to PPPs success in Ireland. In Uganda, PPPs procurement risks emanating from poor and lack of competition in project bidding, high corruption levels and poor or lack of PPPs contract negotiation guidelines were reported to undermine PPP's success in Uganda (Bagenda and Ndevu, 2024). Further, Trung and Nguyen (2023) underscore the importance of the procurement framework clarity in Vietnam's PPPs success.

In the recent past, PPP strategy has recently become a crucial mechanism of financing the public infrastructural projects amid the dwindling government financial resources. The strategy has been largely mooted for attracting private financing to the public projects and public services provision. To this regard, PPPs have been a game changer in provision of public goods in both the developed and developing economies. In Kenya, PPP is enshrined under the PPP framework which is further legally anchored on the PPP Act of 2021 (GoK, 2021). The execution of the PPP framework is domiciled within The National Treasury.

The infrastructure financing gap in Kenya stands reasonably high estimated at approximately $2.1 billion annually. This adversely constrains growth and development especially from the physical infrastructure development perspective. Therefore, the PPP framework provides an alternative funding strategy for the government to cut down on the infrastructure financing deficit. The energy and petroleum projects under the PPP unit review are valued at USD 3,063.52 million with specific projects including: 35MW Menengai Phase I (Sosian), 140MW Geothermal PPP project at Olkaria, Menengai 35MW Geothermal Energy Project (Quantum), 1,050MW Lamu Coal-Fired Power Plant Project and the Transmission Grid Expansion Programme.

However, its notable that project approval does not guarantee implementation. From the Kenya's PPP framework process, upon the project's approval by the PPP committee, there are four more successive stages before the project is closed and ready for actual implementation. These include approval by the cabinet, notification of successful bidders, financial close and finally formalization of concession agreement. Therefore, under the guidance of the PPP framework process, the framework success in realization of implementation of projects via PPP framework is dismal. This therefore warrants the need for a study on the efficacy of Kenya's PPP procurement framework towards PPP projects implementation in Kenya.

However, despite the Kenyan government having institutionalized the PPP framework under the PPP Act 2021, no PPP infrastructural projects have been concluded for implementation under the framework. Kenyan PPPs statistics reveal that by March 2020, the PPP unit has received a total of 80 projects. 63 projects out the total 80 projects were national government originated with county governments originating 11 projects. The Privately Initiated Investment Proposals (PIIPs) were 6. However, while 11 of these projects had reached commercial close with contracts signed, only 1 project had reached financial close (Kenya PPP Unit, 2020). This represents a very large deviation between the total number of PPPs submitted and the projects closed. Therefore, against this backdrop is the is underpinning need for this study which is timely for policy pronouncement towards the actualization of PPP energy projects in Kenya. Against this backdrop, we examine the efficacy of PPP procurement framework in the implementation of PPPs in Kenya's energy sector.

III. RESEARCH METHODOLOGY

The methodology section outlines the plan and method that how the study is conducted. This includes Universe of the study, sample of the study, Data and Sources of Data, study's variables and analytical framework. The details are as follows;

3.1 Population and Sample

The target population of the study was the key personnel / staff of the electricity projects implementing corporations under the ministry of energy namely: The Kenya Electricity Transmission Company, Kenya Electricity Generating Company, Kenya Power and Lighting Company, Geothermal Development Company, Rural Electrification and Renewable Energy Corporation and Nuclear Power and Energy Agency; Public-Private Partnership Unit, Energy and Petroleum Regulatory Authority; Ministry of energy and The National Treasury. Within the electricity projects implementing corporations the target population was 72 members of PPP project appraisal teams from the 6 corporations. Within Energy and Petroleum Regulatory Authority, the target population was 10 Senior Managers. Within the Ministry of Energy, the target population was 3 heads of directorates under the ministry comprising of heads of Renewable Energy Directorate, Electrical Power Development Directorate and Geo-Exploration Directorate. Lastly, in the National Treasury, the target population was the director-general directorate of Public-Private Partnership.

3.2 Data and Sources of Data

The study primarily relied on the primary data collected using structured questionnaires. Data collection was conducted among key respondents within the target population, as they are considered the most knowledgeable and informed regarding issues pertaining to the efficacy of PPP frameworks in project implementation in Kenya. The administration of these questionnaires was conducted directly by the researcher, ensuring a high response rate among the participants.

3.3 Theoretical framework

This study is underpinned on the Project Management Theory and the Hybrid model of project management. Project Management Theory is linked to seminal work of management theory by Fredrick Taylor (1909). According to the theory, a project is regarded as successful if the key stakeholders' expectations are met, project implemented within the cost outlays and planned timelines. However, its notable that stakeholders' expectations are diverse in nature given their dynamic characteristics. Project procurement plays a crucial role in determining project successes it informs proper project management.

Further, is the Hybrid model of project management which is attributed to the works of Smith and Lewis (2011). Just as indicated by its name hybrid, the theory is a mixture of traditional and modern approach to project management. Indeed, it advocates for the project managers to adopt both the traditional and modern or agile project management models. Such mixture is crucial in averting the modern contemporary issues

faced at project management given the evolving environment within which the projects are being implemented today as opposed to past times. Therefore, in line with the Hybrid model of project management, given the complex nature of the energy projects arising from numerous stakeholders, huge financial resources as well as large scope of work, an adoption of a hybrid model of management is core in promoting the efficacy in their management.

To determine the efficacy of PPP procurement framework on project implementation, inferential statistical analysis is undertaken. This entails use of a regression model whereby the independent variables are regressed on the dependent variable. To this effect, Principal Component Analysis is applied to obtain composite index for use in fitting the regression models. In addition, the study embraces both the parametric and non-parametric methods in the analysis. For parametric analysis, given that responses are in the form of Likert ratings, with each representing a specific attribute of an independent variable, Principal Component Analysis is utilized to generate aggregated weighted ratings for each independent variable for each respondent. The same approach is applied on the dependent variable.

Principal Component Analysis is used for scores generation among the variables' attributes. The generated scores are then summarized into 5 quintiles. The choice for 5 quintiles summaries was arrived at by the fact that the responses for the variables took 5 possible outputs as per the Likert Scale. Based on the 5 quintiles summaries the respective ratings is allocated as follows: for scores in the first quintile (0 – 20%), a rating of 1 is assigned; for scores in the second quintile (20 – 40%), a rating of 2 is assigned; for scores in the third quintile (40 – 60%), a rating of 3 is assigned; for scores in the fourth quintile (60 – 80%), a rating of 4 is assigned; for scores in the fifth quintile (80 – 100%), a rating of 5 is assigned. The scores and rating computed from Principal Component Analysis is applied for fitting the regression models. A multivariate Ordinary Least Square model is adopted with the composite index obtained from the Principal Component Analysis used in the model. The general representation of the multivariate Ordinary Least Square model used is as follows:

$$y_i = \alpha_0 + \beta_1 X_i + \beta_2 X_i + \beta_3 X_i + \cdots + \beta_k X_k \ldots\ldots\ldots + \varepsilon_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where: the model dependent variable is denoted by Y and explanatory variables by X(s). The model constant is α while β (s) are the parameters of the model and ε is the model error term.

Since the dependent variable (project implementation) was measured by three different attributes namely: project time, cost and output, then 3 different specific analytical models are defined as follows:

$$\begin{aligned} Time_i = \alpha_0 + \beta_1 Procurement_i + \beta_2 Legal_i + \beta_3 Financial_i + \beta_4 Investment_i + \beta_5 Govt\ policies \\ + \beta_6 Govt\ policies \times Legal_i + \beta_7 Govt\ policies \times Procurement_i + \beta_8 Govt\ policies \\ \times Financial_i + \beta_9 Govt\ policies \times Investment_i \\ + \varepsilon_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2) \end{aligned}$$

$$\begin{aligned} Cost_i = \alpha_0 + \beta_1 Procurement_i + \beta_2 Legal_i + \beta_3 Financial_i + \beta_4 Investment_i + \beta_5 Govt\ policies \\ + \beta_6 Govt\ policies \times Legal_i + \beta_7 Govt\ policies \times Procurement_i + \beta_8 Govt\ policies \\ \times Financial_i + \beta_9 Govt\ policies \times Investment_i \\ + \varepsilon_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3) \end{aligned}$$

$$\begin{aligned} Outcome_i = \alpha_0 + \beta_1 Procurement_i + \beta_2 Legal + \beta_3 Financial_i + \beta_4 Investment_i + \beta_5 Govt\ policies \\ + \beta_6 Govt\ policies \times Legal_i + \beta_7 Govt\ policies \times Procurement_i + \beta_8 Govt\ policies \\ \times Financial_i + \beta_9 Govt\ policies \times Investment_i + \varepsilon_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4) \end{aligned}$$

For non – parametric analysis, Structural Equation Modelling is applied to link the efficacy of PPP procurement framework on project implementation. In this case, Structural Equation Modelling can be considered as a combination of factor analysis, multiple correlation, regression, and path analysis. In this modelling, a path analysis for each measure of project implementation success is developed against all attribute of PPP procurement framework with the standardized coefficient being computed for each path.

The efficacy of the PPP procurement framework is measured by the framework's ability to promote transparency PPP projects procurement process; framework's ability to promote competitive procurement process; irrevocable contract (except through due process); recognition of local, international arbitration for dispute resolution; and Predictable, timetabled identification of projects. PPP project implementation is measured by project delivery time, cost and project output. These metrics served as indicators of the effectiveness and efficiency of the project execution.

IV. RESULTS AND DISCUSSION

4.1 Results of Descriptive Statics of Study Variables

The study's found that 27 out of 78 respondents, constituting 34.62 percent, agreed that the current PPP procurement framework sets out predictable and well-timed identification of PPP projects. Additionally, 15 out of 78 respondents, making up 19.23 percent, strongly concurred with this statement. Conversely, 12 out of 78 respondents (15.38 percent) disagreed with this attribute, while 2 out of 78 respondents (2.56 percent) strongly disagreed. Furthermore, 28.21 percent, of the respondents expressed neutrality, neither explicitly agreeing nor disagreeing with the notion of predictable and timetabled project identification within the PPP procurement framework.

Ensuring an effective arbitration process within the project procurement phase is crucial for timely and cost-effective dispute resolution which prevents project delays. Therefore, it is paramount for the PPP procurement framework to encompass both domestic and international dispute resolution mechanisms. In this context, the study finds that 33 out of 78 respondents, constituting 42.31 percent, agreed that the existing PPP procurement framework recognizes local arbitration processes, while 21 out of 78 respondents, making up 26.92 percent, strongly agreed with this attribute. Conversely, 3.85 percent disagreed with this attribute, and 26.92 percent of respondents neither agreed nor disagreed.

Facilitating competitive procurement of projects not only enhances selection of competitive projects but also promotes transparency in the selection process. The study therefore evaluated to what extent the procurement framework in Kenya encourages competitive procurement of PPP projects. The study finds that 35 out of 78 respondents accounting for 44.87 percent of the respondents agreed the current PPP procurement framework promotes competitive procurement process. 17.95 percent strongly agreed with equivalent disagree proportion disagreeing. 19.23 percent were indifferent of the PPP procurement framework promoting competitive procurement process.

Lastly, the study assessed the degree to which the PPP procurement framework in Kenya fosters transparency in the project procurement. The study finds 42 out of 78 respondents accounting for 53.85 percent agreed that PPP procurement framework promotes transparency in the project procurement with 14.1 percent strongly agreeing. However, 13 out of 78 respondents accounting for 16.67 percent of respondents disagreed with this attribute.

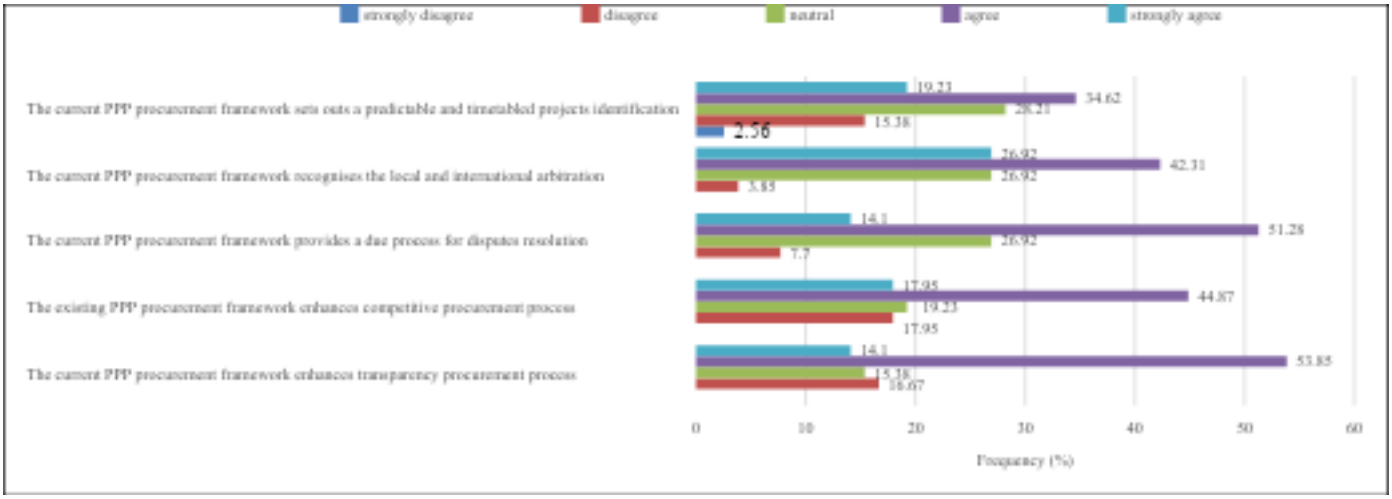

Figure1: Rating of efficacy of procurement Framework

The empirical model results reveal that procurement framework has negative and significant effect on the PPP project implementation time with the effect being significant at 5 percent significance level (*Table 1: Model 1*). Further, procurement framework is found to have a negative and significant effect on the PPP project implementation cost with the effect being insignificant at 5 percent significance level *(Table 1: Model 2)*. Regarding PPP project outcome, procurement was fonds to have a negative and significant effect on the PPP project outcome with the effect being insignificant at 5 percent significance level (*Table 1: Model 3*).

Table 1: Efficacy of PPP procurement framework on project implementation

	Model 1: Project time			Model 2: Project cost			Model 3: Project outcome		
	Coef.	St.Err.	t-value	Coef.	St.Err.	t-value	Coef.	St.Err.	t-value
Procurement framework	-0.216**	0.322	-1.97	-0.134**	0.263	-0.51	-0.331	0.262	-1.26
Legal framework	0.495**	0.263	1.88	0.618***	0.215	2.87	0.618***	0.214	2.89
Procurement framework	-0.216**	0.322	-1.97	-0.134**	0.263	-0.51	-0.331	0.262	-1.26
Financing framework	0.032	0.309	0.10	-0.621*	0.253	-2.46	-0.309	0.252	-1.23
Investment framework	0.326**	0.255	2.18	0.245	0.209	1.17	0.231	0.208	1.11
Govt policy	0.303	0.25	1.21	0.197	0.205	0.96	0.203	0.204	1.00
Legal *govt policy	0.092	0.081	1.14	0.089	0.066	1.35	0.081**	0.066	2.24
Procurement *govt policy	0.148	0.1	1.48	0.035	0.082	0.43	0.078**	0.081	2.96
Financing *govt policy	0.106	0.084	1.26	0.214***	0.069	3.10	0.091**	0.069	2.33
Investment *govt policy	0.199**	0.076	2.60	0.004	0.062	0.06	0.028**	0.062	2.46
Constant	2.095***	0.643	3.26	2.432***	0.527	4.62	2.708***	0.524	5.17

*Note: Significance levels *** p<.01, ** p<.05, * p<.1*

Further, the non – parametric analysis using structural equation model collaborates the empirical model results where procurement framework was found to have a negative effect on project time, cost and outcome. However, a positive effect of the moderating variable: - government policy was found with regard to project cost, time and outcome.

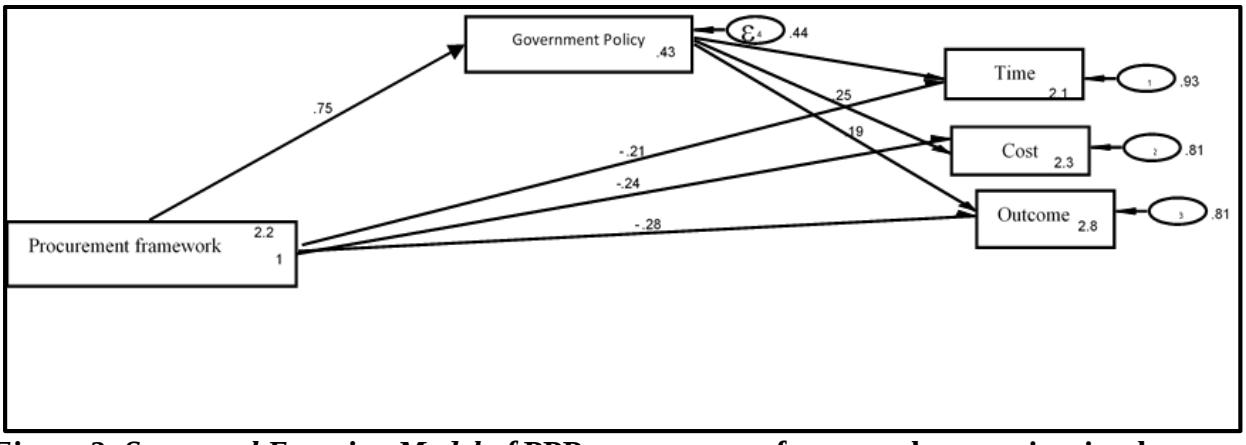

***Figure 2: Structural Equation Model of* PPP procurement framework on project implementation**

The results indicated a significant negative effect of the PPP procurement framework on project implementation time, implying that the procurement framework contributes to prolonged project procurement processes due to stringent requirements such as adherence to public procurement laws and the incorporation of local content policies. These factors collectively extend project timelines, thereby potentially increasing overall project costs associated with bidding processes, negotiations, and legal challenges from unsuccessful bidders. Moreover, the study found that government policy interventions intended to moderate the effects of the procurement framework on project timelines were ineffective, suggesting the rigid nature of the framework. Despite these challenges, the procurement framework exhibited a negative but statistically insignificant effect on project implementation costs, indicating that while it may contribute to delays, its

impact on project expenses was not conclusively significant at the 5% level. This finding underscores the complex relationship between procurement efficiency and project cost containment within PPP contexts.

Comparing the study findings with existing literature reveals mixed results. Atmo et al. (2017) finds that PPP-procured projects generally performed better in terms of timely delivery and operational availability compared to traditionally procured projects, contrary to our findings. However, similar to this study's findings, Atmo et al (2017) noted no significant cost differences between PPP and traditional procurement models, aligning with the notion that procurement frameworks moderated by government policies may have limited effectiveness in curbing cost overruns.

Additionally, O'Shea, Palcic, and Reeves (2019) and Chasey, Maddex, and Bansal (2012) also highlight varying impacts of PPP procurement frameworks on project outcomes, with considerations for cost efficiencies and operational effectiveness. These studies provide context to the complexities involved in balancing the benefits of PPP frameworks with the challenges posed by regulatory frameworks and procurement practices. Furthermore, Zhang's (2005) examination of PPPs in infrastructure development underscores the critical role of efficient procurement frameworks in project implementation. Zhang (2005) identified common challenges such as inefficient procurement practices, corruption risks, and lengthy legal disputes that can hinder project progress. These findings resonate with the challenges observed in the Kenyan context, particularly concerning delays and inefficiencies attributable to the PPP procurement framework. However, findings by Chan et al. (2010) in China suggest that transparent and efficient PPP procurement processes supported by comprehensive frameworks can enhance project success and infrastructure provision. This contrasts with some aspects of the Kenyan experience, suggesting potential lessons in improving procurement frameworks to achieve better outcomes.

Procurement is found to have a negative and significant effect on the PPP project implementation cost with the effect being significant at 5 percent significance level. This implies that the current procurement framework is detrimental to the overall project performance. This outcome could be explained by the lengthy procurement process PPP projects go through prior to their finalization. Further, the effect of lengthy procurement process implies increased costs. Cost associated with the bidding process, negotiation, lengthy process pertaining to contract award complaints arising from bid losers among others.

Further, the results reveal that the moderating effect of government policy on procurement framework has positive effect on PPP project implementation time though the effect is insignificant at 5 percent significance level implying to the rigidity nature of the procurement framework such that even the intervention of the government policy cannot unlock the bottlenecks in the procurement framework. Regarding the project cost, procurement framework was finds to have a negative and significant effect on the PPP project implementation cost with the effect being insignificant at 5 percent significance level given that the respective p – values is greater than 5 percent significance level.

Based on these findings, several policy recommendations are proposed to address these challenges and improve the efficacy of the PPP procurement framework in Kenya. First, is the pressing need to review and streamline the PPP procurement framework to address issues that cause project delays, increased costs, and negative project outcomes. This review should focus on optimizing the procurement process.

Secondly, is the emphasize the importance of adhering to stipulated timelines within the procurement process. Delays in procurement can lead to significant project delays and cost overruns. Clear guidelines and mechanisms for adhering to timelines should be established. Third, is the need to consider implementation of alternative dispute resolution mechanisms to address litigation and legal issues arising from the procurement process. This can help resolve disputes more efficiently and avoid costly legal redress.

Moreover, there is the need for the government to encourage Privately Initiated Public-Private Partnerships, which may have fewer procurement-related challenges compared to traditional PPP projects. These initiatives can help expedite project implementation. Additionally, the government through the PPP unit needs to implement a pre-tender stage in PPP projects where only approved projects in the PPP pipeline are considered. Projects should meet specific criteria such as clear project descriptions, estimated costs, and tentative procurement dates. Projects that do not meet these criteria should be dropped to avoid delays. Lastly, is the need for conducting awareness campaigns and sensitization programs to educate stakeholders, including government agencies and private sector partners, about the importance of adhering to procurement timelines and best practices.

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