

Construction Risks and Completion of Public Private Partnership Project in Kenya: A Case of Sondu-Miriu Hydroelectric Power Project

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Abstract

Due to its perceived success, Public Private Partnership (PPP) is accepted and recommended worldwide as a tool for efficient, transparent and effective strategy which guaranteed value for money for public sector projects which had previously known persistent and consistent failure leading to disappointments. The purpose of the study was to investigate the influence of construction risks on completion of PPP projects. The objective of this research was to investigate the influence of construction risks on completion of Public Private Partnership projects. The study tested the null hypothesis that: Construction risks do not significantly influence the completion of Public Private Partnership Project in Kenya. The study adopted descriptive survey design and targeted the entire management of Sondu-Miriu Hydroelectric Power project totaling 85 obtained from the contracting parties where a sample of 71 was selected through proportionate sampling. Questionnaires and interview schedules were used for data collection while Cronbach Alpha was used as a measure of reliability and established that the overall questionnaire reliability was $\alpha=0.753$. Quantitative and qualitative techniques were used in data analysis where multiple regression analysis was used to establish the relationship between the variables. The study found a response return rate of 39/71 (54.93%) where 64.1% had worked for at least 3 years in their respective organizations, 61.5% were graduates and majority of the study participants 28 (71.8%) had engineering training. The study concludes that: construction risks: construction time overrun, construction cost overrun and labor related risks significantly influence completion of construction PPP projects such that as construction risks increase, completion of PPP projects decline. The study recommends that the Government, as the key employer in PPPs should design and implement effective policies that will minimize if not eliminate construction time overrun, cost overrun and labor related risks.

Keywords: Construction risks; Completion of PPP projects; Public private partnerships

Introduction

There is an emerging trend in the construction sector to set up Public-Private Partnerships as a way of fulfilling Public tasks. A Public Private Partnership arrangement occurs where the private and public sectors work together to deliver public projects. Alexanderson and Hulten [1] assert that the principles and procedures of operating within the private sector are introduced and simulated in the administration of public projects to enhance efficiency and improve on service delivery for the public. Due to its perceived success, PPP is accepted and recommended worldwide as a tool for efficient, transparent and effective strategy which guaranteed value for money for public sector projects which had previously known persistent and consistent failure leading to disappointments. The failure in the projects was attributed to wrong or poor choices of policies as well as bureaucracy [1]. The expansion of the public sector consequently ceased to be the automatic policy preference in most developing countries [2].

PPPs refer to contracts and arrangements where public and private investors jointly come together so as to realize a symbiotic relationship to finance, execute and deliver projects aimed at public benefit. Consequently, PPPs focus on mutual involvement through sharing of costs, risks as well as benefits between the public and private sector arising from the particular PPP by exploiting the strengths of either side while simultaneously overcoming their limitations. Public-Private Partnerships provide one mechanism for achieving social goals because Government involvement in developing and managing partnerships can provide communities with the necessary resources and incentives to pursue various initiatives. In Kenya, the concept of Public-Private-Partnership has picked up with the government entering into partnerships with Private sector investors in the provision of various services. Sondu-Miriu hydroelectric power project

is situated in Kisumu County. The project relies on water from River Sondu-Miriu. The project was started by Kenya Electricity Generating Company limited and financed by Government of Japan. The project was to be completed by 2005 but due to delay it was completed in November 2011 [3].

Research objectives

The objective of this research was to investigate the influence of construction risks on completion of Public Private Partnership projects.

Research hypothesis

The study tested the null hypothesis that:

H_0 : Construction risks do not statistically significantly influence completion of Public Private Partnership Project in Kenya

Literature Review

Completion of public-private partnership projects

According to a study [4], the private provision of public infrastructure and services has the potential to offer enhanced value for

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money and enable the government to use the private sector's delivery and project collection expertise and capabilities for the benefit of the people and the wellbeing of the country at large. Additionally, it also helps the government to better understand the whole of life cycle cost of investment and enable more rigorous project assessment and sharing of risk with the private sector [5].

It is widely recognized that one of the critical aspects that affects the success of a PPP project is the risk management, which involves the identification of the key risks, their allocation between the parties, and the adoption of suitable strategies to mitigate risks when they occur [6]. Smith, Merna and Jobling [7] also points out that risk has emerged as a key feature of PPP contracts as it can shift the balance between conventional public procurement and the PPP option. As such, project risks must be explicitly identified and minimised, shared, transferred, and managed by the contracting parties [8]. The Treasury's general principle of risk transfer is that risks should be transferred to the parties best able to manage them [9]. However, the nature of risk may be complex, and it has been argued that PPP may rest on a conceptual conflation of risk and uncertainty [10]. A study [11] on African construction industry in Turmoil in Southern Africa showed that 80% of projects are not completed as scheduled due to contract forms that are not negotiated in order to ensure a fair and familiar distribution of risks.

Construction risks

Multifarious strategies could be adopted to effectively mitigate construction risks. A study [12] in Greece on Risk Management in PPP projects; a case study on the motorway sector adopted a mixed-methods research that combines quantitative and qualitative research methods. The research used a Delphi technique for primary data collection. The Delphi technique is a method of eliciting and refining group judgments. The Delphi technique was used with two independent panels of 15 and 30 participants. Questionnaires and interview schedules were used for data collection and multiple case analyses was used. Based on the results of a Delphi survey that collected the opinions of experts, the study found that most critical risks in PPP motorway projects were both endogenous and exogenous to the project. As regards the first category, the most significant, for its high probability of occurrence and its high impact, was the demand/usage risk which was one of the revenue risks that occurred during the Operation phase. For this catastrophic risk, experts agree that the preferred risk allocation was to both parties and that the more suitable risks mitigation strategies were Revenue sharing mechanism and Revenue distribution mechanism. Other endogenous key risks, less severe than the previous one, were cost overrun and financial closure risk, classified as undesirable and unacceptable, respectively. The former occurred in the Construction phase and, coherently with its nature, the preferred risk allocation was to the private party.

Too few large-scale infrastructure projects are implemented through PPPs and in sectors that are not considered as ideal according to the literature. In South Africa, a study [13] sought to find out to what extent were PPPs suitable for the long-term development of infrastructure in South Africa, and factors affecting proper completion and impletion of the PPP projects. This study analyses what has been done in terms of PPPs in South Africa so far and to determine to what extent PPPs are, in the current situation, adequate to respond to the long-term infrastructure needs of the country. The study adopted mixed methods approach and collected data from a sample of 25 managers of various PPP projects using questionnaires and semi-structured interviews. Results show that these partnerships are still far

from being such a tool in South Africa. He further argues that reforms are required to make processes and legislation simpler, to increase the public sector's capacity to deal with these partnerships and to give a higher visibility and general Commitment to the PPP concept among politicians, authorities and the population. He concludes that if these issues were to be resolved, these partnerships would have great potential as a tool for the long-term development of South Africa's infrastructure.

Abiero [3] looked at challenges of stakeholders' management in implementation of Sondu-Miriu Hydro Electric power project in Kenya, with emphasis on how compensation and relocation of the people would affect the project. Studies done in Kenya have shown that 73 percent of project assessed experienced time overruns and 38 percent suffered cost overruns [14]. Another study [15] showed that the most serious source of cost and time related risks in building projects during construction period is extra work (variations). According to him this occurs in 73per cent of building projects in the population whereas defective materials accounted for 38.2 percent for observed unacceptable quality work cases. Construction performance in Kenya is inadequate. Despite the fact that projects are supervised by very qualified human resources, they end up failing [16].

Theoretical framework

The study was anchored on the contingency theory. The word "contingency" indicates how the environment (external source of risk) relates with the system, and determines the activities and construction of an organizational system [17]. Improvement in organizational effectiveness is what contingency theory aims at in order to respond to uncertainty in performance. Contingency is mainly generated for removing or decreasing the negative outcomes of unforeseen events. The novelty of contingency theory, as recognized [15], is adaption of a new way to be identified for specific structures and activities which are the most appropriate for the current requirement of the organization.

Contingency theory recognizes that there are a range of contextual variables (time overrun related risks, cost overrun related risk, labor related risks), each influencing the project. This research investigates the influences of these risks and the interaction between them on completion of PPP Sondu-Miriu Hydroelectric Power Project. Any of these risks may have an influence on the project and hence contingency theory can be suitable to be used for covering these influences depending on the situation of the project.

Panthi, Ahmed and Ogunlana [18] have pointed out that PPP projects are complex and unique, and because it is difficult to evaluate the level of risks in PPP projects and it is therefore also hard to apply risk management activities appropriately. One of the unavoidable outcomes of a PPP project is variation that may lead to adverse impacts on time, cost and quality. Hence, utilizing contingency theory in projects is useful for mitigating these variations that arise later. Therefore, in this thesis, different categories of risk are evaluated with a particular attention on cost. Cost and time is very influential in PPP projects because except from the factors which may impact the cost of any project in its lifetime; the PPP projects mostly have a bidding phase dealing with competitive estimation of an appropriate cost for implementing the project and this is what contingency theory is capable of, as it is risk-based and flexible.

Conceptual framework

From the literature review, the study identified time overrun, cost overrun and labor related risks as the construction risks that affect

completion of PPP projects. Thus, for PPP Projects, the study sought to establish their influence on the completion of PPP projects. The conceptual framework is presented in Figure 1.

Methodology

This study was anchored on pragmatic paradigm which focuses on the research problem [19] which in this study was completion of Sondu-Miriu Hydroelectric Power Project. The study applied the mixed methods approach which incorporates the use of qualitative and quantitative methods concurrently and sequentially in a single study [20,21]. The study used descriptive survey research design and correlation research design to test hypothesis. The study targeted the entire management of Sondu-Miriu Hydroelectric Power project totaling 85 obtained from the contracting parties. Yamane [22] formula was used to calculate the sample and yielded a sample size of 71 who were selected through proportionate sampling such that 26 were from the contractor, 20 from the employer, 20 from the engineer and 5 from the financiers. The study used both quantitative and qualitative data from the respondents of Sondu-Miriu Hydroelectric Power Project thus questionnaires and interview schedules were used. The questionnaire was structured in accordance with the study objectives of mainly Likert items.

The pilot testing was done at Oluch Kimira Irrigation project in Homabay County. Content validity was achieved through experts in the area of project planning providing guidance in assessing the accuracy with which the questions in the instruments captured the variables under investigation. To ascertain reliability of the questionnaire, Cronbach Alpha was used as a measure of reliability. Construction time overrun related risk scale had a reliability coefficient of $\alpha=0.742$, construction cost overrun related risk scale $\alpha=0.630$, labor related risks $\alpha=0.809$ and completion of PPP projects $\alpha=0.830$. Thus, the overall questionnaire reliability was $\alpha=0.753$. The researcher together with the research assistants ensured that the questionnaires distributed to the respondents were collected and returned for data analysis and processing. The questionnaire items were checked for completeness and a follow up done to ensure that the questionnaires lost and the ones left blank were re-administered to ensure increased response rate of questionnaires. This study applied quantitative and qualitative analysis.

In descriptive statistics, data was described and summarized into distribution of scores and measurements such as measures of central tendency, variability, relationship and association in frequencies and percentages using Statistical Package for Social Sciences (SPSS. v. 20) as software for data analysis. Multiple regression analysis was used to establish the relationship between the variables according to the equation:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon$$

Where: Y=Completion of PPP projects, β_0 =Constant Term; $\beta_1, \beta_2, \beta_3$ =Coefficients of the independent variables; X_1 =Construction time overrun related risks; X_2 =Construction cost overrun related risks; X_3 =Labour related risks and ϵ =Error term.

Results and Discussions

Background information

The study found a response return rate of 39 (54.93%) which according to Saunders (2003), a response return rate of at least 50% is acceptable in social sciences research. A cumulative majority 25 (64.1%) had worked for at least 3 years in their respective organizations. Majority of the respondents 24 (61.5%) were graduates with another 10 (25.6%) having post graduate qualification while only 5 (12.8%) had diploma qualification. Further, majority of the study participants 28 (71.8%) had engineering training while 4 (10.3%) had training in administration.

Completion of Public-Private Partnership Projects

In the study, the dependent variable was completion of public private partnership projects, a case of Sondu-Miriu hydroelectric power project. The dependent variable was measured using a 5-point Likert scale as 1=strongly disagree (SD), 2=disagree (D), 3=neutral (N), 4=agree (A) and 5=strongly agree (SA). The data obtained was analyzed to show frequency of each response as well as percentage per item. Item mean and standard deviation was equally computed and presented alongside each item as shown in Table 1.

From the findings in Table 1, the study found that the participants were satisfied with the overall outcome of the project (Mean=4.03 \pm 1.04) where majority of the respondents 17 (43.6%) agreed with the statement with another 14 (35.9%) strongly agreeing. Cumulatively,

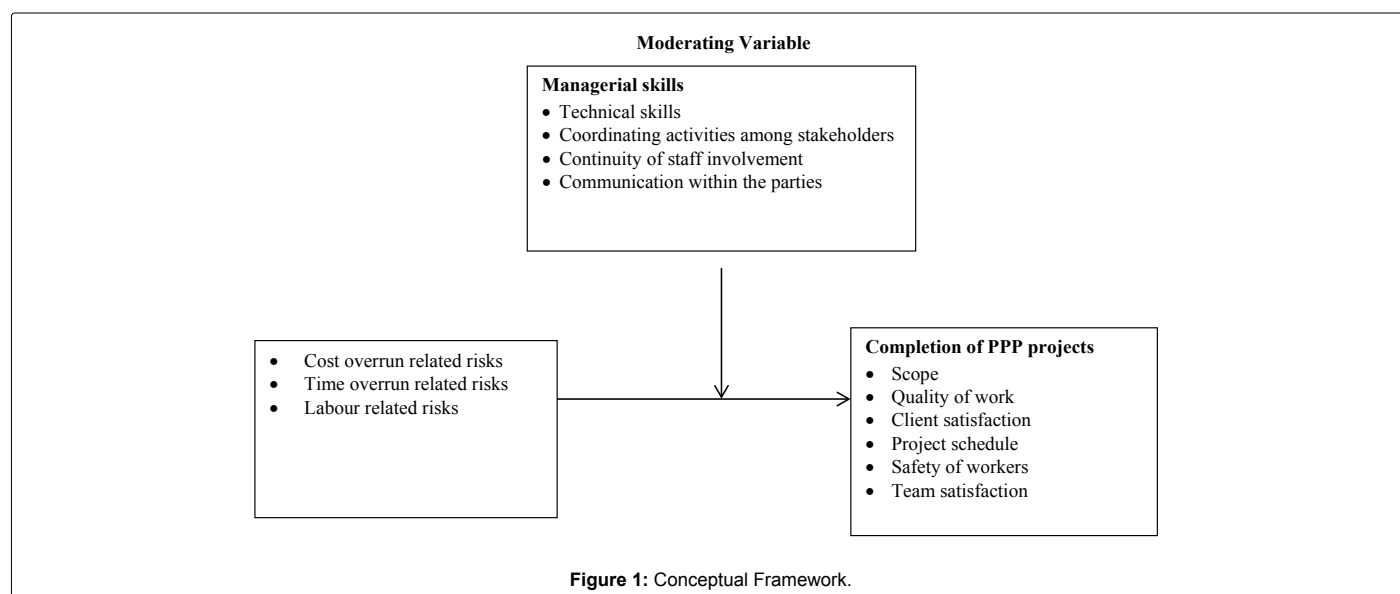


Figure 1: Conceptual Framework.

| Statement | SD | D | N | A | SA | Mean ± SD |
|---------------------------------------------------------------------------------------|---------------|-------------|------------|-------------|-------------|-------------|
| I am satisfied with the overall outcome of the project | 2 5.1% | 1 2.6% | 5 12.8% | 17 43.6% | 14 35.9% | 4.03 ± 1.04 |
| I am satisfied with the quality of the work | 3 7.7% | 2 5.1% | 6 15.4% | 15 38.5% | 13 33.3% | 3.85 ± 1.18 |
| The project was completed within a reasonable timeframe | 17 43.6% | 10 25.6% | 3 7.7% | 5 12.8% | 4 10.3% | 2.21 ± 1.40 |
| During the work, there were no potential safety hazards that were not addressed | 6 15.4% | 8 20.5% | 4 10.3% | 10 25.6% | 11 28.2% | 3.31 ± 1.47 |
| The construction project was completed without unnecessary interruption | 10 25.6% | 16 41.0% | 7 17.9% | 2 5.1% | 4 10.3% | 2.33 ± 1.22 |
| The construction project was completed in strict adherence to the safety requirements | 12 30.8% | 13 33.3% | 4 10.3% | 6 15.4% | 4 10.3% | 2.41 ± 1.35 |
| Composite Mean ± Standard Deviation | 3.021 ± 0.810 | | | | | |

Table 1: Completion of PPP Projects.

31 (79.5%) of the respondents agreed that they were satisfied with the overall outcome of the project. Thus, in terms of completion of PPP projects, the outcome was satisfactory to a larger extent as indicated by the respondents who were also the key participants in the project. These findings [23] noted that most important performance indicators for evaluating project performance were quality of finished project, cost and time.

Similarly, the project participants were satisfied with the quality of the work (Mean=3.85 ± 1.18). This emerged as majority of the respondents 15 (38.5%) agreed that they were satisfied with the quality of the work with another 13 (33.3%) strongly agreeing. Although 5 (12.8%) of the respondents cumulatively disagreed that they were satisfied with the quality of the work, the overall opinion indicated satisfaction with the quality of work in the project. However, the study found that the project was not completed within the expected timeframe (Mean=2.21 ± 1.40). Specifically, majority of the study participants 17 (43.6%) strongly disagreed that the project was completed within a reasonable timeframe with another 10 (25.6%) disagreeing. Thus, overall, 27 (69.2%) of the participants were of the opinion that the project was not completed within the expected time frame. This finding shows that there were general delays in completion of works which led to failure to complete the works in time. Similarly, the study found that there were unnecessary delays in the construction of Sondu-Miriu Hydroelectric power project (Mean=2.33 ± 1.22). This emerged as majority of the respondents (41.0%) disagreed that the project was completed without unnecessary interruption while 10 (25.6%) strongly disagreed. Thus, 13 (66.6%) of the respondents disagreed that there were delays in the construction work which ultimately affected the completion of the construction work. Similarly, a study [24] found that bundling responsibilities for multiple infrastructure service components transfers more risk to private partners and lowers overall cost.

The findings further show that the project was not completed in strict adherence to the safety requirements (Mean=2.41 ± 1.35). Based on the statement that the project was not completed in strict adherence to the safety requirements, majority of the respondents 13 (33.3%) disagreed while 12 (30.8%) strongly disagreed. This shows that a cumulative 25 (64.1%) of the respondents consider that the work was not completed in strict adherence to the safety requirements. On a similar note [23] also asserted that assessment of risk of cost overruns and delivery of project within budget is also a major challenge in Ugandan construction industry.

In terms of risk hazards and injuries, there was an average view

that there were no potential safety hazards that were not addressed (Mean=3.31 ± 1.47). This emerged as majority of respondents 21 (53.8%) cumulatively agreed that there were no potential safety hazards that were not addressed. The finding shows that there are significant potential safety hazards which emerged during the construction project. To corroborate this, a study [24] also explains that risk is inherent with construction projects and PPP projects are no exception as stakeholders need to manage complexities associated with documentation, capital budget, taxation, technical details, policies and market conditions.

Construction risks and completion of PPP projects

A multiple linear regression analysis was conducted with the construction risks as the predictor variables and completion of PPP projects as the outcome variable [25]. Thus, there were three predictors namely cost overrun related risks, time overrun related risks and labor related risks obtained through summation of scores in the individual scales. The regression output is presented in Table 2.

The model shows that construction risks (construction time overrun related risks, construction cost overrun related risks and labor related risks) account for 95.2% ($R^2=0.952$, $p<0.001$) of the variance in the dependent variable (completion of PPP project). The ANOVA shows that regression is a good fit for the data with $F(3, 35)=232.6$ which is statistically significant ($p<0.05$). Further, on examining the coefficients of the variables, the constant term ($B=39.51$; $p<0.001$), construction time overrun related risks ($B=-.633$; $p<0.001$), construction cost overrun related risks ($B=-.045$; $p=.038$) and labor related risks ($B=-.016$; $p=.028$) were found to be statistically significantly predict completion of PPP project. The multiple regression equation connecting the variables was modeled as:

$$Y=B_0+B_1X_1+B_2X_2+B_3X_3+\epsilon$$

Where Y is completion of PPP project, B is the coefficients, X_1 is construction time overrun related risks, X_2 is construction cost overrun related risks and X_3 is Labour related risks respectively.

The equation thus becomes: $Y=39.51 -0.633X_1 -0.045X_2 -0.16X_3 +\epsilon$

This shows that as the construction risks increase, the completion of PPP projects decline. Similarly, a study [12] found that endogenous key risks were cost overrun and financial closure risk, classified as undesirable and unacceptable, respectively.

The study tested the null hypothesis that:

H_0 : Construction risks do not significantly influence the completion

| Model Summary | | | | | | |
|----------------------------|-----------------------------------------|-----------------------------|-------------------|----------------------------|--------|--------------------|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | | |
| 1 | 0.976 ^a | 0.952 | 0.948 | 0.568 | | |
| ANOVA ^a | | | | | | |
| Model | | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | 225.1 | 3 | 75.02 | 232.6 | 0.000 ^b |
| | Residual | 11.29 | 35 | 0.323 | | |
| | Total | 236.4 | 38 | | | |
| Co-efficients ^a | | | | | | |
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 39.51 | 0.992 | | 39.85 | 0 |
| | Construction time overrun related risks | -0.633 | 0.043 | -0.931 | -14.59 | 0 |
| | Construction cost overrun related risks | -0.045 | 0.051 | -0.044 | -0.886 | 0.038 |
| | Labour Related Risks | -0.016 | 0.045 | -0.019 | -0.35 | 0.028 |

^aDependent Variable: Completion of construction project.

^bPredictors: (Constant), Labour Related Risks, Construction cost overrun, Construction time overrun

^aDependent Variable: Completion of construction project.

^bPredictors: (Constant), Labour Related Risks, Construction cost overrun, Construction time overrun.

Table 2: Construction Risks and Completion PPP Projects.

of Public Private Partnership Project in Kenya.

Since the study established that construction risks accounted for 95.2% ($R^2=0.952$, $F(3, 35)=232.6$; $p<0.001$) of the variance in completion of PPP projects, this provides evidence of rejection of the null hypothesis. The null hypothesis was therefore rejected and the study concluded there was a significant influence of construction risks on completion of PPP projects.

Conclusions

Based on the study findings, the study concludes that construction risks: construction time overrun related risks, construction cost overrun related risks and labor related risks significantly influence completion of PPP projects. Specifically, as the construction risks increase, completion of PPP projects decline.

Recommendations

The study recommends that the Government as the key employer in PPPs should design and implement effective policies that will minimize if not eliminate construction time overrun related risks, Construction cost overrun related risks and labor related risks. This can be achieved through maintaining a database of contractors, consultants and financiers with their performance and project delivery database. Such a system should be maintained, updated and strictly utilized in selection of project participants so as to ensure successful completion of PPP projects.

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