



Risk Analysis of Procurement Options: Implications for Construction Firms in Ghana

Timothy Adu Gyamfi^{a*}, Richmond Boadaa^b, Benjamin Adu-Fosu^c

^a*Mphil Construction Technology, Department of Design and Technology, University of Education, Winneba*

^b*MBA Logistic and Supply Chain Management, Kwame Nkrumah University of Science and Technology*

^a*Email: agttimo78@gmail.com*

^b*Email: richmond2boadaa@yahoo.com*

^c*Email: tabonoh@yahoo.com*

Abstract

In Ghana, procurements risks have led to the liquidation of construction firms. It is therefore important for the construction firms in Ghana to align analysis of risks with procurement options in order to reduce losses and avoid liquidation. In view of this, the study investigates risk analysis of procurement options employed by construction firms in Ghana. The study was conducted within the Ashanti Region of Ghana primarily to identify the risks posed to the various procurement options. Statistically, there are at least 38 construction firms located within the Ashanti Region. In all, a sample frame of 60 participants was drawn for the study. The two main risks identified in the study to be posed to the various procurement options adopted by construction firm in the Ashanti Region of Ghana included economic risks and technological risks. Conclusively, the corroborative evidence between risk analysis and procurement options in Ghanaian construction firms is not promising.

Keywords: Construction management; risk analysis; risk management; procurement.

* Corresponding author.

1. Introduction

General risk models accept the fact that production is associated with uncertainties, which may hinder yielding optimum output [1]. These uncertainties, also known as risks, are typically described as events or conditions that may have an impact on the objectives of production [2]. Risks therefore concern the deviation of one or more results of future events from their expected values. Technically, the impact of risks may be positive or negative, but general usage tends to focus only on potential harm that may arise or accrue from incurring a cost or failing to attain some particular benefits [3].

Procurement options are underlying framework agreements, which are the arrangements of forward and backward linkages, such as the sources of supplies and building materials for the project [4]. The choice of procurement option implies different ranges of responsibilities, opportunities and risks for the various actors, as well as different degrees of stakeholder collaboration [5, 6]. The potential risks can be effectively assessed if they are contextualised and balanced against the benefits associated with a particular option. This relates to the procurement cycle which is assessed within five contexts of risks, namely; technological risk, societal risk, market risk, financial risk, and turbulence risk [4]. In this context, the risks that may be considered include technology shift between procurement selection and delivery, misalignment of users' expectations to project outcomes, and late delivery of supplies. Other economic factors, such as the rate of inflation that may cause procurement to exceed budget, as well as the risk of a change in the strategic direction of the client institution may also be considered [7].

The procurement options therefore determine the risk management options and the extent to which they can reduce the costs, increase profits, maintain brand quality, and avoid business insolvency [8]. All these can be achieved through risk planning and analysis of project delivery method, form of payment, and use of collaboration or partnering arrangements [4]. These assertions are established under financial economics theories [9], managerial theories [10] and the stakeholder theory [11]. These theories establish the rationale for risk management and emphasise that risk management generically and in procurement, is a process that often involves developing the context of the risk, identifying the risk, analysing the risk, as well as treating and monitoring the risk. However, managing procurement risk is more so complicated by risk allocation within the diverse sub-categories of procurement [12]. In line with the stakeholder theory, an appropriate allocation of risks between actors in a construction project is important because it is impossible to eliminate all potential risks as emphasised by the blocked maxima theory [13].

Owing to its complexity, many countries have legislation that regulates contractual relationships [14]. These legislations are formulated under contract law, equality and race relations, freedom of information, health and safety law, waste and environmental regulations, and public procurement legislations [15]. However, the construction industry still faces many risks and challenges.

In developing countries, for instance, contractors have limited access to funding sources, especially contractors in the small-and-medium bracket. One of the biggest consequences of this is that it prevents them from satisfying the financial requirements and the risks it poses to procurement [16]. In Nigeria, the procurement

risks confronting indigenous contractors include those pertaining to supplies and prices of materials, obtaining interim payment, negotiating variation payment, on-site material control, reliable tenders, financial management, supervision by client, technical know-how, commitment to construction and personnel management [17].

In Ghana, procurements are challenged by delayed payments to contractors for work completed and disparity between Ghanaian currency and foreign currencies in which cost of equipment and material are costed. In some cases, risks have led to the liquidation of construction firms [18]. It is therefore important for construction firms in Ghana to align analysis of risks with procurement options in order to reduce losses and avoid liquidation through proper risk analysis programme. In view of this, the study investigates risk analysis of procurement options employed by construction firms in Ghana. Specifically, the study aims to identify the risks posed to the various procurement options in construction firms.

2. Literature Review

2.1 Procurement Options

Hopkin establishes that a risk is generally the probability of an unwanted event or the cause of an unwanted event which may or may not occur [19] whilst Al-Bahar maintains that, risks in construction can be categorised under six thematic areas, which are natural disasters, physical risks, financial and economic risks, political risks, design risks and construction related risks [20].

Some researchers have agreed that the first step of procurement practice is making selection from the various procurement strategies. For instance, once a client has established a business case for a project, appointed a principal advisor, determined their requirements and brief, then consideration as to which procurement options to be adopted should be made. In this case, an understanding of the characteristics of various procurement options is required before a recommendation can be made to a client [21].

Another study also revealed that an appropriate allocation of risks between actors in a construction project is important because it is impossible to eliminate all potential risks [22]. Some other studies also emphasis that risk allocation influences the behaviour of project actors and, therefore, has a significant impact on the project performance in terms of the total cost [13]. In Eriksson's study, the form of contract, whether design-bid-build, design-build or partnering defines the risk allocation [23].

In design-build contracts the contractor is responsible for both design and construction. The client signs only one contract. In the procurement documentation, the clients set their demands in terms of functionality [24]. Generally, design-bid-build contracts exhibit strength or advantages by allowing for flexibility for the client in terms of design and the possibility to choose the best tender for both design and construction [8, 25, 26].

The popularity of design-build contracts has increased in recent years, because a single point of responsibility is attractive to clients [27]. From the risk management perspective, it has been asserted that the design-build contracts are more attractive for the client as the responsibility for design implies more risk allocated to the

contractor. On the other hand, the design-build alternative may be more expensive compared with the design-bid-build contract. Furthermore, the quality of the final product may be lower if the contractor uses cheaper solutions, trying to decrease his own costs [23]. This problem is especially relevant in contracts with a lump sum payment mechanism [28].

In terms of time, there is an argument that the design-build system provides an earlier start of the project execution than is the case for other forms. Several studies of the risk management aspects in different forms of contract indicate that clients choose the design-build contracts more often when the project's timeframe and availability of resources are critical factors [29, 30]. In Sweden, smaller contractors prefer the performance-based contracts or general contracts in particular. In the case when a design-build contract is used, the contractors increase the price by including the insurance for the extra risks [26]. However, the competence requirements are higher in the design-build contracts, and structured risk analysis should be done very early in the project [28].

3. Methods and Materials

The study adopted a quantitative approach to collect and analyse the numerical data of the phenomenon. Questionnaire was used as the main instrument to solicit the primary data. The study drew a population which was made up of construction companies within the Ashanti Region. The sample size was made up of twenty (20) randomly selected construction companies. Construction managers, quantity surveyors, site supervisors and site engineers were purposively selected from twenty (20) construction companies. This is because, these individuals are assumed to have the requisite knowledge about the phenomenon under investigation. Totally, a sample frame of 80 participants was drawn for the study.

The study employed both primary and secondary data. Primary data were sought from the contract managers, quantity surveyors, purchasing officers and site engineers of the targeted construction firms. Books, articles, and relevant documents were reviewed as secondary sources of information.

In analyzing the data gathered, the relationships between the variables were tested using cross-tabulations and their statistical significance of the associations was tested using the chi-square values and their associated p-values as in the study by Hakansson and his colleagues [28].

4. Results and Discussions

4.1 Procurement Option adopted by Construction Firms

In the study, Table 1 showed that exactly 54.3 percent of the respondents pointed out that management contracting were the most popular procurement option adopted by the firms. This was confirmed by the respondents from the local firms and the foreign firms. Literature reveals that, in this option, the contractor has direct contractual links with all the works contractors and is responsible for all construction work [31].

Table 1 contains the results of the analysis of procurement options adopted by construction the firms, these include design and build, management contracting, design and manage and private-public partnership.

Table 1: Procurement options adopted by construction firms

Approach	Origin		Total
	Local	Foreign	
Design and build	8(22.9)	5(20.0)	13(21.7)
Management contracting	19(54.3)	13(52.0)	32(53.3)
Design and manage	6(17.1)	7(28.0)	13(21.7)
Private-public partnership	2(5.7)	0(0.0)	2(3.3)
Total	35(100.0)	25(100.0)	60(100.0)

Source: Field survey, 2013

4.2 Risk Analysis of Procurement Options

1. Procurement Options and Economic Risks

The probability of economic risks associated with the chosen procurement options was explored in the study as a precedent to assessing the types of economic risks and the effects that they have on procurement. The results were based on multiple responses of 60 respondents of the study. In Table 2, it is shown that 73.3 percent of the responses indicated that the various procurement options are associated with some forms of economic risk, while 26.7 percent declined the assertion that there were no any economic risks associated with their chosen procurement options. The respondents however noted under the design and build procurement that this form of procurement was not associated with any form of economic risks. On the other hand, majority of the respondents said management contracting, design and manage and private-public partnership was associated with some form of economic risk.

The types of economic risks to which the procurement options were susceptible, were explored in the study. This was based on the possibility that the procurement options could be prone to a variance of economic risks, which could lead to undesired effects. Moreover, this was an antecedent examination to matching the procurement options to their effects on the procurement approaches. The results were based on the multiple responses of 31 respondents. A higher proportion of 51.7% of the respondents in Table 3 stressed inflation and price change as one of the economic risks that affect procurement. The results also indicated that fluctuations in foreign exchange rates and changes in the financial objectives firms also posed economic risks to the

procurement approaches of the construction firms.

Table 2: The Susceptibility of Procurement to Economic Risks

Response	Procurement Options				Total
	Design and build	Management contracting	Design and manage	Private-public partnership	
	f(%)	f(%)	f(%)	f(%)	f(%)
Economic risk	5(38.5)	24(75.0)	13(100.0)	2(100.0)	44(73.3)
No economic risk	8(61.5)	8(25.0)	0(0.0)	0(0.0)	16(26.7)
Total	13(100.0)	32(100.0)	13(100.0)	2(100.0)	60(100.0)

Source: Field survey, 2013

Table 3: Types of Economic Risks in Procurement

Risks	Procurement approach				Total
	Design and build	Management contracting	Design and manage	Private-public partnership	
	f(%)	f(%)	f(%)	f(%)	f(%)
Inflation	1(12.5)	19(63.3)	11(44.0)	0(0.0)	31(51.7)
Foreign exchange fluctuations	0(0.0)	4(13.3)	9(36.0)	2(50.0)	15(25.0)
Changes in financial objectives of the firm	5(62.5)	0(0.0)	3(12.0)	0(0.0)	8(13.3)
Changes in import/ export tariffs	2(25.0)	0(0.0)	2(8.0)	2(50.0)	6(10.0)
Total	8(100.0)	23(100.0)	25(100.0)	4(100.0)	60(100.0)

Source: Field survey, 2013

The disaggregated results in Table 3 showed that the economic risks identified were not evenly associated with the procurement approaches. For example, with the exception of private-public partnerships, all the other procurement options were noted for their susceptibility to inflationary forces. On the other hand, changes in import and export tariffs affected all the procurement approaches.

One aspect that was also delved into in the study was the effects of the economic risks identified on the procurement options. According to the results, the major effects of the economic risks on procurement were that they led to insufficient funds for the project completion and also contributed to high uncertainty in budget preparation.

2. Procurement Options and Natural Disasters

According to Table 4 of the study, 45.0% of the respondents were of the view that natural disasters posed a minimal threat to construction and procurement of projects, while 8.3% indicated that natural events posed no threat to their projects. Further statistical results indicated that the distribution of the responses was associated with a chi-square of 2.421 and a p-value of 0.490. This showed that there are no statistical differences in the level of risks posed by natural occurrences to local and foreign construction firms in the Ashanti Region. This may be logically explained by the fact that the firms are exposed to the same weather conditions and also by the fact that the geographical area under study is not a risk area for natural disasters [27].

Table 4: Level of risks posed by natural occurrence

Risk level	Firm ownership		Total
	Local	Foreign	
No risk	4(12.1)	1(3.7)	5(8.3)
Minimal	15(45.4)	12(44.4)	27(45.0)
Moderate	2(6.1)	0(0.0)	2(3.3)
Severe	2(6.1)	1(3.7)	3(5.0)
No Response	10(30.3)	13(48.1)	23(38.4)
Total	33(100.0)	27(100.0)	60(100.0)

Chi-square = 2.421; df = 3; p-value = 0.490

Source: Field survey, 2013

3. Procurement Options and Technological Risks

Table 5, showed that, 55.0% of the respondents indicated that the procurement options adopted by the various firms were prone to technological risks.

This was confirmed by all the respondents from the local and the foreign construction firms. However, very few of the respondents indicated that they did not face any technological risks in their procurement practice. These findings were associated with a chi-square value of 7.368 and a p-value of 0.007. The differences in the responses were statistically significant at an alpha of 0.05. This implies that there is statistically significant correlation between procurement options and technological risks.

Table 5: Possibility of technological risks in procurement

	Firm ownership		
	Local	Foreign	Total
Are there technological risks	f(%)	f(%)	f(%)
Yes	23(69.7)	10(37.0)	33(55.0)
No	0(0.0)	4(15.0)	4(6.7)
No Response	10(30.3)	13(48.0)	23(38.3)
Total	33(100.0)	27(100.0)	60(100.0)

Chi-square = 7.368; df = 1; p-value = 0.007

Source: Field survey, 2013

The actual technological risks identified by the firms were also examined in Table 6. It was noted that 25.0% of the responses pointed to the inadequacy of funds to purchase needed technology as one of the risks associated with their project management.

This was expressed by 25.0% of the responses from the local firms and 25.0% of the responses captured from the foreign firms. In relation to the inadequacy of funds was the risk of break-downs.

This was confirmed by 22.5% of the responses from the local firms and 30.0% of the responses from the foreign firms. Moreover, the risk of misapplying the acquired technology was also noted by 18.3% of the responses. This was also noted in association with the inadequacy of skilled labour to tend to the project technology.

The disaggregated responses showed that a higher percentage of the responses from the local firms referred to the inadequacy of funds to acquire technology as the major technological risk. On the other hand, a higher proportion of the responses from the foreign firms indicated that their major technological concern was with the possible break-down of equipments.

Table 6: Types of technological risks in procurement

	Firm ownership		
	Local	Foreign	Total
Technological risks	f(%)	f(%)	f(%)
Inadequate funds	10(25.0)	5(25.0)	15(25.0)
Risk of break-downs	9(22.5)	6(30.0)	15(25.0)
Misapplication	8(20.0)	3(15.0)	11(18.3)
Inadequate skilled labour	8(20.0)	2(10.0)	10(16.7)
No Response	5(12.5)	4(20.0)	9(15.0)
Total	40(100.0)	20(100.0)	60(100.0)

*Multiple responses; n =33

Source: Field survey, 2013

4. Implications of Risk Analysis of Procurement Options

An appropriate allocation of risks between actors in a construction project is important because it is impossible to eliminate all potential risks [22].

The risk management approaches that work best for the construction firms, in this study, were indicated by the respondents.

The result in Table 7 indicated that 41.7% of the respondents noted that generally, the qualitative use of intuition and judgements based on past experiences was the most effective method of risk analysis.

On the other hand, the respondents also noted quantification of potential losses and gains to be an effective risk analysis method.

The results from the multiple responses therefore showed that most of the firms were inclined to use qualitative means of analysing risks associated with procurement.

5. Conclusions

Basing on the results above, it is apparent that the main risks posed to the various procurement options adopted by construction firm in the Ashanti Region of Ghana included economic risks and technological risks. There is a corroborative evidence as per results obtained that the implications of risk analysis of procurement options for

Ghanaian construction firms is not promising. The economic risks were mostly concerned with inflation, but others were concerned with foreign exchange fluctuations, changes in financial objectives of the firms, and changes in import/export tariffs. The major effects of the economic risks on procurement were that they led to insufficient funds for the project completion and also contributed to high uncertainty in budget preparation. The technological risks influencing the procurement options included the risk of break-downs of equipments, inadequate funds to purchase needed technology, misapplication of the technology and inadequate skilled labour to tend the acquired technology.

Table 7: Matching Risk Analysis Methods to Procurement Approaches

	Procurement approach				Total
	Design and build	Management contracting	Design and manage	Private-public partnership	
Risks	f(%)	f(%)	f(%)	f(%)	f(%)
Intuition/judgements	8(57.1)	13(48.1)	2(14.3)	2(40.0)	25(41.7)
Quantification of loss	4(28.6)	8(29.6)	7(50.0)	0(0.0)	19(31.7)
Empirical predictions	0(0.0)	4(14.8)	4(28.6)	0(0.0)	8(13.3)
No Response	2(14.3)	2(7.5)	1(7.1)	3(60.0)	8(13.3)
Total	14(100.0)	27(100.0)	14(100.0)	5(100.0)	60(100.0)

It was established, as gathered in the results of the research, that risk analysis process were undertaken by mostly firms’ management team and also supported by the contractors, supervisory staff and private consultants. The decisions made from risk analysis were mostly for the purposes of deciding to continue or abort the project. Finally, the risk analysis approach adopted by firms was mostly quantifying the possible losses over gains. Generally, the qualitative use of intuition and judgements based on past experiences was found to be the most effective method of risk analysis.

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