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# Critical Risks in Construction Projects in Ethiopia

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## ABSTRACT

Construction management is a very important process in order to achieve the objectives of every project in terms of time, cost, quality, and insured safety. But most recent studies most researchers have been focusing on the management of risks rather than identifying the critical risks involved in construction projects. This paper aims to identify the major risks associated with construction projects that expected to affect project performance during the project life cycle in Ethiopia. Various risk factors in construction projects were identified from the literature. Questionnaire survey and interview method was used to collect data from the respondents. The relative importance index (RII) was used for data analysis to identify the major variables. Based on the analysis of the likelihood of occurrence of the risks, this paper identified the critical risks in construction projects in Ethiopia. The research found that the critical risks were mainly unforeseen site conditions, improper design, incomplete contract documents, inflation, lack of timely decision making, scope change, political instability, payment delay, lack approvals, corruption, and poor contract administration. Finally conclusions made from the finding and recommendations forwarded to minimize risks in construction projects.

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## 1. Introduction

Construction projects can be extremely complex and fraught with uncertainty. Construction projects are always unique and risks raise from a number of the different Sources (Oyegoke, 2006). Risk and uncertainty can potentially have damaging consequences for the construction projects (Flanagan *et al.*, 2006). It is well accepted that risk can be effectively managed to mitigate its' adverse effects on construction project objectives, even if it is common in all project undertakings. Therefore nowadays, the risk analysis and management continue to be a major feature of the project management of construction projects in an attempt to deal effectively with uncertainty and unexpected events and to achieve project success. Risk management helps the key project participants – client, contractor or developer, consultant, and supplier – to meet their commitments and minimize negative impacts on construction project performance in relation to cost, time and quality objectives. Traditionally, practitioners have tended to

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associate construction project success with these three aspects of time, cost and quality outcomes. While risks cannot be eliminated, successful projects are those where risks are effectively managed, of which early and effective identification and assessment of risks is essential.

Risk management in the construction project management context involves identification, assessment and prioritization of risks by monitoring, controlling, and applying managerial resources with a coordinated and economical effort so as to minimize the probability and/or impact of unfortunate events and so as to maximize the realization of project objectives (Douglas, 2009). Project risk management, which has been practiced since the mid-1980s, is one of the nine main knowledge areas of the project management institute's project management body of knowledge (Tuysuz *et al.*, 2006).

The rapid growth of the Ethiopian economy calls for massive development of infrastructures and assets. While this brings opportunities to project stakeholders, employing effective risk management method to cope with risks associated with variable construction activities is of importance to implement the projects aligning with project objectives including time, cost, quality, safety and environmental sustainability. This paper presents the critical risks influencing the achievement of project objectives in the Ethiopian construction industry with the aid of questionnaire surveys. Finally, the research findings will contribute to both the practice and research in risk management for Ethiopian construction industry and also provide valuable information for those international companies who intend to provide construction project management service to Ethiopia.

## **2. Review of Literatures**

There are numerous definitions of risks in the scientific sources. In PMBOK (2004), the risk is defined as discrete happenings with negative or positive effects on the project. Despite of varied definitions for the risk, all contain a unique concept. In most of definitions for the risk, two aspects "loss" and "uncertainty" have been mentioned.

Basically, the risk management is not a new concept and it has been applied natively using experts' opinions (Mills, 2001). Risk management in a project encompasses identifying influencing factors that could potentially negatively impact a project's cost schedule or quality baselines; quantifying the associated potential impact of the identified risk; and implementing measures to manage and mitigate the potential impact. The riskier the activity is, the costlier the consequences if the wrong decision is made.

Risk = Probability of an event  $\times$  Consequence of loss due to that event. Risks cannot be totally avoided, but the choice can be made so that risk is minimized. Peoples usually tend to use their direct intuitive understandings, experiences, and judgments in the decision making in construction projects. Flanagan *et al.* (2006) defined the construction project as a set of non-repetitive activities with unique specifications such as long term period, complex processes, and unfavorable environment, financial/investment issues, and dynamic organizational structure. There are different methods of risk evaluation. The construction projects are naturally of imposing uncertainties which their analysis depends on the analyzer's mentality.

A systematic process of risk management involves risk identification, risk analysis, and risk response, where risk response has been further divided into four actions, i.e. retention, reduction, transfer and avoidance by applying managerial resources with a coordinated and economical effort so as to minimize

the probability and/or impact of unfortunate events and so as to maximize the realization of project objectives (Douglas, 2009).

Risk identification is the first step of risk management process, in which potential risks associated with a construction project are identified. As an integrative part of risk identification, risk classification attempts to structure the diverse risks affecting a construction project. Many approaches have been suggested in the literature for classifying risks. In risk analysis it is crucial to identify the different attribute of risk, due to the fact that risk allocation necessitates to understand the attributes of risks, thus to assign them to those who can treat them accordingly. There may be two sources in a construction project from where various risks are deduced. They may be external or internal risks. External risk comprises of environmental impacts. Internal risk comprises of the uncertainties which exists within the project.

Previous studies of several authors focused on the identification and classification of risks involved in construction projects. Some of the authors include Chen *et al.* (2004); Ruqaya *et al.* 2012; Tumi *et. al.* (2009); Sweis *et. al.* (2008); Markmann *et al.* (2013); Assaf and Al-Hejji (2006); Shen (2001); Koushki *et. al.* (2005) and others cited various risk factors that contributed to a project delay and cost overruns and quality degradation. All of them identified different risk factors and categorized them in to internal and external risks which will occur in construction projects.

From the works of the above researchers, external risks that are beyond the control of the project team were grouped into (1) political risks, (2) economic risks, (3) legal risks, (4) social risks, and (5) nature risks. On the other hand, internal risks that arise from the specific nature of the project and events, and are within the control of the project team were divided into (1) design risks, (2) construction risks, (3) financial risks, (4) management risks; and (5) maintenance risks. Both the external and internal risks and their associated categories are identified.

### **3. Research Method**

The research methodology selected for this risk investigation includes a comprehensive literature review, questionnaire surveys and interviews. Questionnaires for the survey were developed based on the variables identified from the literatures. The questionnaire consisted of two sections. Section A solicited general information about the respondents. Section B carried out risk factors associated with construction projects. From the relevant literatures 72 variables or risk factors were identified and the respondents were requested for each factor to rate using five point scale of 1 to 5 was adopted. It was categorized as follows 5=very high; 4=high; 3=medium; 2=low; and 1=very low.

Ethiopia has 9 Regional States and questionnaires were sent to all regions. A total of 24 questionnaires were sent via email and other networks to construction industry participants in the states including respondents from clients, consultants, and contractors. The questionnaires were distributed to 6 clients' staff, 9 consultants' staff, and 9 contractors' staffs who were experienced professionals. The method of data analysis used for analysis of data from the questionnaires survey was the Relative Importance Index (RII) method as shown below.

$$RII = \frac{\sum a * n * I}{N * 5}$$

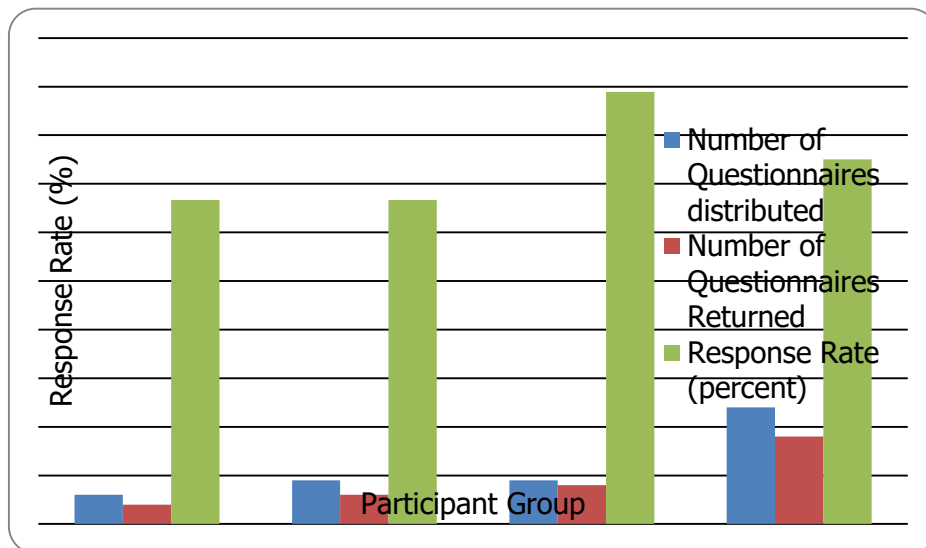
Where:  $a$  = constant expression weight,  $n$  = frequency of response, and  $N$  = total number of response. The higher the value of RII, the more frequent the risk occurrence would be to measure the variables.

Six interviews with senior professionals involved in construction industry were conducted to find out the major risks from their experience. They were asked open-ended questions with face-to-face interviews to improve the quality of the information gathered. The interviewees were chosen from the clients, the consultants, and the contractors group to increase the reliability of the data. The interviewee were experienced professionals including one project manager, two contract administrators, one resident engineer, one architect, and one site engineer.

#### 4. Data Analysis and Discussions

The research was conducted using a questionnaire survey and interview to validate the findings of the study. The questionnaire was compiled on the basis of a compiled list of risks involved in construction projects for quantitative study. The quantitative study was conducted to measure the variables identified from the literatures. The respondents were asked to rate the all the risk factors related to construction projects on a 5-point scale to determine their occurrence. The interviews were conducted for qualitative study to increase the reliability of the data. Open ended questions were forwarded to the interviewee and they were asked to give their opinions on the frequency of risks in construction from their experience.

During the questionnaire survey a total of 24 questionnaires were distributed and only 18 were returned representing a response rate of 75.00%. The respondents involved in the survey had several years of experience in handling various types of construction projects. The category of the respondents participated in the survey are summarized in **Figure 1** below. It indicates that the majority of the respondents (44.44% respondents) are working with contractors organizations followed by consultants (33.33% respondents) and clients (22.22% respondents). All the respondents were experienced professionals in managing large construction projects.



**Figure 1.** Questionnaire Survey Response

All risks observed in the questionnaire can happen to any construction projects. The main purpose of this investigation is not to identify a list of risks but to ascertain the critical risks that can significantly influence the delivery of construction projects. Hence, only the top ten ranked ones are chosen as critical risks in this study.

Disregarding the risk category, all risks are ranked in accordance with the RII scores measuring their significance on the project performance as shown in **Table 1** below.

**Table 1.** Risk Frequency in Construction Projects

<b>Types of Risks in Construction Projects</b>	<b>RII</b>	<b>Ranking</b>
<b>A. External Risks</b>		
<b>Political risks</b>		
Bribe and corruption	0.844	1
Disputes and strikes	0.689	2
Insecurity and crime	0.667	3
Political instability	0.612	4
Government act	0.600	5
War threat	0.411	6
<b>Economic risks</b>		
Price inflation	0.867	1
Currency exchange rate	0.789	2
Resources availability and quality	0.744	3
Fund transfer fees	0.678	4
Tax rate	0.600	5
<b>Legal risks</b>		
Authorities and regulations requirements	0.667	1
Permits and licenses	0.644	2
Law and arbitration system	0.644	3
Altered contract forms	0.622	4
Import and export restrictions	0.600	5
Intellectual property protection	0.533	6
Legal entity establishment	0.500	7
Nationalism and protectionism	0.456	8
<b>Social risks</b>		
Language barrier	0.589	1
Holidays and celebrations	0.589	2
Culture differences	0.533	3
Religious differences	0.378	4
<b>Nature risks</b>		
Inclement climate	0.544	1
Natural catastrophic events	0.478	2
Pestilence	0.378	3

Different time zones	0.378	4
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**B. Internal Risks**

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**Design risks**

Differences in design practices and standards	0.833	1
Latent design defect	0.800	2
Inaccurate supplemental design information	0.789	3
Defective/late design documents	0.756	4
Excessive design review	0.733	5
Contractors/subcontractors design insurance	0.700	6

**Construction risks**

Inadequate schedule	0.900	1
Equipment and labor productivity	0.833	2
Subcontractors performance	0.811	3
Differing and unforeseen site conditions	0.778	4
Progress acceleration	0.767	5
Accident/safety	0.767	6
Project location and accessibility	0.744	7
Material, equipment or work furnished by other contractor	0.744	8
Testing laboratories	0.744	9
Material, equipment or work furnished by owner	0.644	10
Long lead material/equipment	0.622	11
New technology	0.611	12
Hazardous material	0.567	13

**Financial risks**

Late, nonpayment and minimum amount of interim payment	0.878	1
Constructive changes	0.778	2
Error in bids/quotation	0.756	3
Subcontractor payments	0.756	4
Cardinal changes	0.656	5
Indirect, consequential and punitive damages	0.622	6
Retention	0.600	7
Assessment of liquidated damages	0.556	8

**Management risks**

Submittals and approvals	0.878	1
Power of engineer to fix rates	0.833	2
Projects supervision and administration	0.822	3
Coordination between design firms	0.811	4
Coordination between subcontractors/suppliers	0.811	5

Contractual relationship intervention	0.778	6
Request for information	0.744	7
Insurance, bonds and guarantees	0.733	8
Insufficient compensation and project delivery strategies	0.722	9
Insufficient scope definition	0.700	10
No damages for delay	0.689	11
Packages consideration	0.656	12
<b>Maintenance risks</b>		
Testing and acceptance	0.811	1
Substantial completion acceptance and payment release	0.811	2
Maintenance period	0.811	3
As built drawing preparation	0.800	4
Final payment	0.778	5
Warranty and decennial liability	0.678	6
Site clearance	0.644	7

From the interview result, the major risks in construction projects were unforeseen site conditions, improper design, incomplete contract documents, inflation, lack of timely decision making, scope change, political instability, payment delay, lack approvals, corruption, and poor contract administration. Most of the interviewee pointed out that unforeseen condition, and incomplete contract documents as the major risks in construction.

### **Critical Risks in Construction Projects in Ethiopia**

From **Table 1** above, the finding shows that inadequate schedule is the first ranked most critical risk in the Ethiopian construction industry, with an RII value of (0.900). This construction risk contributes the most significant negative impacts on construction project performance in terms of time, cost and quality. Late, nonpayment and minimum amount of interim payment and submittals and approvals of construction documents are the second and the third most critical risks in Ethiopian construction industry both with an RII value of (0.878). These risks are among financial and management risks respectively and are likely to affect the project progress due to delay in payment and document approvals by the client and the consultant. This could be due to lack of timely decision of the managers. As Oluwaseyi (2012) noted, managers often rely heavily on their experience and on the insight of other key personnel involved in the process. The fourth ranked critical risk in the industry is price inflation (0.867) which is among the economic risks. Many construction projects progress are affected and some of them are terminated in the country due to price inflation occurred by increment in dollar value on imported construction materials. As it was found from the interview result inflation is among the risks they pointed. Construction project involves uncertainties like inflation which is unpredictable. According Flanagan *et al.* (2006), uncertainty can potentially have damaging consequences for the construction projects. Bribe and corruption which is one of the political risks is the fifth most critical risk in construction industry (0.844). Corruption is one of the factors in many countries which expected to affect construction project performance. Because construction takes more of the government budget, especially in developing countries like Ethiopia. And also from the interview finding, corruption is one of the major risks in construction industry in Ethiopia. The sixth ranked critical risk is differences in design practices and standards which categorized under

design risk (0.833) and equipment and labor productivity follows as the seventh ranked risk (0.833) and it is among the construction risks. Power of the engineer in contract management which categorized under the management risks is the eighth ranked risk (0.833). The ninth and the tenth ranked risks are projects supervision and subcontractor's performance (0.822) and (0.811) respectively and both risks are management risks. The finding showed that management risks are the most critical risks in Ethiopian construction industry.

## **5. Conclusion**

The aim of any construction project is to achieve project objectives within the schedule of work, cost, and specified quality to meet client's requirement. But events that may affect construction projects objectives are risks. In this study, the most key risk factors which have a significant effect on construction projects performance are identified and classified through a comprehensive literature review. It is resulted from various factors which had been identified in this study. A total of 72 variables or risk factors were analyzed statistically using relative importance index method. Interviews conducted with relevant construction project participants for qualitative study to get the various risk factors from their experiences. The finding showed that the inadequate schedule, equipment and labor productivity (construction risks), payment delay, submittals and approvals of construction documents (financial risks), price inflation (economic risk), bribe and corruption (political risk), differences in design practices and standards (design risk), and power of the engineer, project supervision, and subcontractors' performance (management risks), are the major risks in construction projects in Ethiopian construction industry. The finding also indicated that most of the risks are from construction and management risks. This implies that attention is to be put during construction and management of construction projects to avoid the occurrence of major risks.

## **6. Recommendation**

From the finding, the construction stage has highest level of risks since it involves a high investment of money, time and effort in the project completion. Management is also the major source of risks in construction. Therefore, project risks can be minimized by focusing on the construction of the project and applying a proper management for the major risks. The lack of proper management practices is one of the reasons the Ethiopian construction projects are experiencing. In short, the awareness of risk management is still at a relatively low level in the current Ethiopian construction industry. The construction stakeholders should implement risk management strategies in the Ethiopian construction industry to increase the performance of construction projects. A proper guideline and model should be developed for the industry for formal risk management. This finding would not only provide the major risks in Ethiopian construction industry, but they could also be server in other countries. Therefore related research has to be conducted in other countries and proper remedies should be reported to minimize the occurrence of risks in construction projects.



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