

Risk Management Considerations for Civil Engineering Consultancy Services in Guyana

Latchman Singh^{1*}, S. P. Sreekla²

¹Public Works Department, Regional Democratic Council, Mahdia, Region # 8, Guyana, South America

²Centre for Research and Development, School of Management, KPR College of Arts Science and Research, Coimbatore, India

Abstract

Identification of the possible risks that will affect the projects, knowing them will allow control of these, will increase the probability of success of the projects, and the level of confidence of the involved will increase by decreasing the level of uncertainty of the project. The development of this work is comprised of five phases, first was a planning to structure the processes to follow evaluating, stages, then the risks that will affect the project and their characteristics, the qualitative analysis was performed, prioritized for actions, evaluating and estimating their probability of occurrence and their impact, then the plan was designed for the treatment and response to risks to reduce, retain and transfer their threats during the development of the project itself and finally give the guidelines for the monitoring and control of risks. Based on the above, the following question is generated: What are the risks to consider in consultancy services for the Project of Construction, to guarantee success in the execution, monitoring, and control of the same? The purpose of the research will be to: Analyze qualitatively the risks identified that meet the standards mandated by the construction oversight body in the construction sector. This research would have used a qualitative approach by utilizing information gathered from secondary sources as the main source of data and presented an office study approach rather than a fieldwork data structure. The result was identifying Risk Management factors for the Project of Construction to offer a tool that helps in better decision-making and to establish implementing strategies that guarantee the fulfillment of the objectives of quality, and costs of the Project.

Keywords: Management, Plan, Project, Risk.

Introduction

One of the most important aspects of the success of a project is the ability to deal effectively with the risks that are part of each process. According to studies carried out by the Project Management Institute (PMI), the area of knowledge less applied and practiced on projects is the management of the risks that may arise from time to time, in many projects an informal approach to risk management is taken to ignore the possible risks that may arise in the progress of the project. Every project is

associated intrinsically with a set of risks requiring an established, documented, and effective implementation plan; it is here that the risk management process is vitally important to allow the planning and prevention of possible risks, avoiding delays in execution times, quality problems, poor estimation of resources or, at worst, the failure of the project. The purpose of Risk Management is to minimize the impact of negative risks (threats) and maximize the positive risks (opportunities) identified for the project. This is achieved by identifying all

the risks of the project, assessing their probability of occurrence and potential impact, and creating action plans to manage the risks identified.

Literature Review

The background of any investigation to be executed in its works and reports must have similarities or form a relationship with the research objective, in terms of data, methodologies, and tools used.

The Ministry of Natural Resources and the Environment and the Geology and Mines Commission; were the first in Guyana to attempt to investigate the study and deal with the same problem or others related to it. This information serves as a guide to the researcher and allows him to make comparisons and to have ideas on how the problem was dealt with at that previous time of investigation. The result of the study was as follows:

1. Elaboration of a Preliminary Risk Management Plan that represented a very useful approach to the considerations necessary to consider by the Project team from the perspective of the probability of occurrence of events that negatively affect the execution of the same.
2. Some risks arising in the early stages of the project may be avoided by clarifying the requirements, obtaining information, improving communication, or acquiring experience. Also, taking early actions to reduce the likelihood of a risk occurrence and/or its impact on the project is often more effective than trying to repair the damage after the risk has occurred.
3. The proposal developed in this study provides a solid platform for the subsequent establishment of a Better Consolidated Plan, which provides for a more precise quantitative analysis of risks, its affection to the variables of time, cost, and scope of the Project, its measurement and finally an adequate strategy of monitoring and control to dissipate the

probabilities of occurrence of the same ones.

Research Gap

The development of this work was to identify, draft, and discuss a type of relationship for consultancy services and civil engineering firms and the effect of risk management applications, for a viable management model.

Project Risk Management

The definition of risk is viewed as offering a double benefit in terms of opportunity and threat within a single project [1].

Risk is perceived as the flipside of value, implying that risk and value management are two interrelated concepts that should be undertaken as paralleling in a project [2].

According to [3], project risk is, "... an uncertain event or condition that, if it occurs, has an [positive or negative] effect on at least one project objective."

Risk Analysis and Management

Risks associated with the construction industry can be broadly categorized into:

1. **Technical Risks:** The risks associated with Incomplete Design, Inadequate specification, inadequate site investigation, change in scope, Construction procedures insufficient resource availability, etc. are termed as technical risks.
2. **Construction Risks:** These risks include Labor productivity, Labor disputes, Site conditions, Equipment failures, Design changes, high-quality standards, and new technology.
3. **Physical Risks:** The risks arising from Damage to structure, Damage to equipment, Labor injuries, Equipment & and material fire and theft, etc. are known as physical risks.
4. **Organizational Risks:** The organizational risks consist of Contractual relations, Contractor's experience, Attitudes of participants, inexperienced workforce, and Communication.

5. **Financial Risks:** Increased material cost, Low market demand, Exchange rate fluctuation, Payment delays improper estimation taxes, etc. are related to financial risks.
6. **Socio-Political Risks:** Changes in laws and regulations, Pollution and safety rules, Bribery/Corruption, Language/Cultural barrier, Law and order, War and civil disorder, and Requirement for permits and their approval.
7. **Environmental Risks:** Natural Disasters and Weather Implications.

Risk vs Uncertainty

Risk is defined as the “cumulative effect of the probability of uncertain occurrences that may positively or negatively affect project objectives”. Although the terms risk and uncertainty are often used interchangeably, they are not the same. Risk unlike uncertainty, which considers only the event and where the probability is completely unknown [4].

Reference is made to uncertainty as something unknown and risk as something that can occur. According to these authors, much of the risk in projects comes from uncertainty, but other factors contribute to project risk, for example, the timeframes and deadlines, costs, scarcity of resources, inadequate abilities, and competencies, among others [5].

The traditional forms of dealing with risk tend to concentrate on variability events and little consider the view of existing ambiguities in projects. For them, variability refers to the elements of a project that can assume distinct, though uncertain, values, such as deadlines, costs, and quality. Ambiguity is already associated with the lack of clarity of the data, the details, and structures among other factors since there is bias in the behavior of those involved, restricted knowledge, and unclear situations [4].

Risk is commonly considered as a negative, uncertainty is a more up-to-date concept, it includes the positives and negatives, the first

being the opportunities and the second the threats.

Risk Management Process

The risk management process is defined by [6] as: “The systematic application of management policies, procedures, and practices to the tasks of reviewing communicating, establishing the context, identifying, analyzing, evaluating, treating, monitoring and communicating risk”.

The Risk Management Plan is not an optional activity, it is essential for the success of the project, it must be present in all phases of execution, and therefore, be included in the plans and operational documents of any project from the beginning to the culmination, in this way, it becomes an integral part of all the aspects of the management of the same, in each phase and each group of processes.

Six (6) processes within risk management were established by [7], which are the following:

1. **Risk Management Planning:** The objectives of this process are to develop strategies for how risk management will be carried out and to integrate project risks with all other project management activities. Careful and explicit planning improves the possibility of success of the other five risk management processes, in this process, we decide how to tackle and carry out the risk management activities of a project. The planning of risk management processes is important to ensure that the level, type, and visibility of risk management are consistent with the risk and the importance of the project for the organization, to provide sufficient resources and time for risk management activities, and to establish an agreed basis for assessing risks.

2. **Identification of risks and their classification:** Risk identification determines what risks can affect the project and documents its characteristics; in this process, all project stakeholders must participate. Risk identification is an iterative process because

new risks can be discovered as the project progresses through the lifecycle, it is impossible to identify all the risks at the beginning of the project. Over time, the level of risk exposure in the project increases because of changes in decisions and measures taken internally and externally. The frequency of iteration and who will participate in each cycle will vary from case to event. The project team must participate in the process to develop and maintain a sense of belonging and responsibility for the risks and actions associated with responding to the risks. Those interested outside the project team can provide additional information about the objectives.

The establishment for the process of identification of risks, some critical factors of success, which are the following [8]:

1. Iterative identification.
2. Pop-up ID.
3. Complete identification of risk sources.
4. Multiple identification prospects.
5. Risks must be linked to the objectives of the project.
6. The identified risks should be described clearly and unambiguously.
7. If necessary, identify the risks with various levels of details.
8. Target identification of risks.

3. Qualitative Risk Analysis: This process includes the methods to prioritize the risks identified for other analysis or subsequent actions, evaluating, and combining their probability of occurrence and their impact. Organizations can effectively improve project performance by focusing on high-priority risks. This process evaluates the priority of the risks identified using the probability of occurrence, the corresponding impact on the project objectives if the risks occur, as well as other factors such as the deadline and risk tolerance of project restrictions such as cost, time, scope, and quality. Critical success factors, according to [8] are as follows:

1. Use the agreed approach (analysis based on probability of occurrence and impact on individual objectives).
2. Use agreed definitions (probability and impact levels on objectives).
3. Collect high-quality information about the risks.
4. Perform Iterations to the qualitative analysis of risks.

4. Quantitative risk analysis: The quantitative analysis of risks is done concerning the risks prioritized in the previous process because it has a significant impact on the concurrent demands of the project. This process analyzes the effects of these risks and is assigned a numerical rating. By conducting the quantitative risk analysis process, a numerical estimate of the overall impact of the risks in the project objectives is obtained, based on the current plans and the available information, by considering all the risks simultaneously [9]. The results of this type of analysis can be used to assess the probability of success in achieving project objectives and to estimate contingency reserves, usually at appropriate time and cost, and risk tolerance for the project. A quantitative method can also be applied to make decisions in the event of uncertainty, using Monte Carlo's simulation techniques and the analysis by decision tree. Critical success factors for this process, according to the [8] are as follows:

1. Follow the logical sequence: identify – prioritize – qualitative analysis – quantitative analysis.
2. Use an appropriate project model as a basis for quantitative analysis.
3. Collect information from high-quality hazards.
4. Impartiality in data-taking and risk information.
5. Identify the relationships between common root risks if they are likely causes to occur.

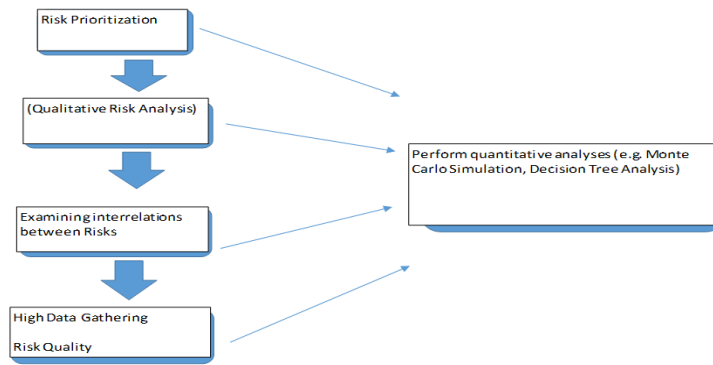


Figure 1. Structure of Quantitative Risk Analysis [3]

Figure 1; depicts the various sequences in project risk management to identify risk or uncertainty and how they are applied to garner an outcome using quantitative analysis techniques such as the Monte Carlo simulation techniques.

5. Risk-response planning: Risk-response planning is the process of developing options and determining actions to improve opportunities and reduce threats to project objectives, at this stage risks are addressed based on their priority, introducing resources and activities in the budget, schedule, and management plan of the project, as needed, in addition to assign the people to take responsibility for each response to the risks agreed and financed. The contingency response actions of a risk must be executed at an optimal time, for this reason, the answer specified for each of these risks should include a description of the corresponding activation conditions.

6. Risk Monitoring and Control: It is the process of identifying, analyzing, and planning new risks, tracking identified risks, re-analyzing existing risks, tracking residual risks, and reviewing responses while assessing their effectiveness.

The effectiveness of the Risk Management Plan depends on how the approved plans are carried out. These plans must be successfully executed, reviewed, and updated regularly. If

this is done correctly, the effort invested will be rewarded and future projects will benefit from the experience of this project. The main objectives of surveillance and risk control are to monitor the risks identified, monitor residual risks, identify new risks, ensure that response plans are implemented at the right time, and assess their effectiveness throughout the project's lifecycle [10]. The corresponding set of responses and activation conditions have been defined and specified for each risk-set situation. It is the responsibility of the holder of the action to ensure that these conditions are monitored effectively and that the corresponding actions are carried out as defined timely.

Results and Discussion

Identification of Risk Factors Relating to Consultancy Services in Civil Engineering

Risk factors in construction projects can be split into two major groups [11]:

1. Internal risks, which fall within the control of clients, consultants, and contractors.
2. External risks, which include risk elements that are not in the control of key stakeholders.

Risks need to be identified and managed at an early stage of the construction process.

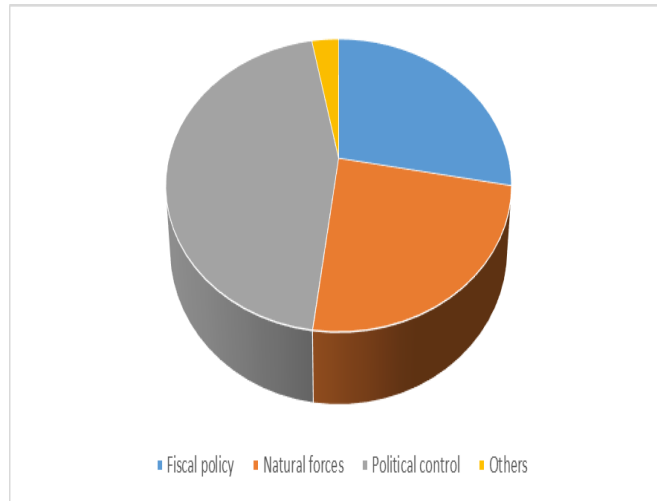


Figure 2. Representation of External Project Risks

Figure 2; highlights the top three external risks identified:

1. Fiscal policy (28%)

2. Natural forces (24%)

3. Political control (45%)

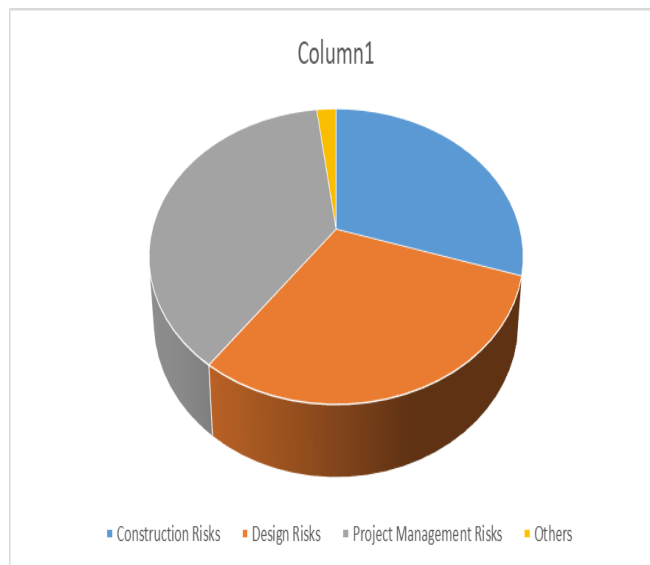


Figure 3. Representation of Internal Project Risks

The above figure identifies project-level risks according to their possible effect on construction project objectives. The top three important categories of internal risks identified are:

1. Construction risks (30%)

2. Design risks (30%)

3. Project management risks (38%).

These risk factors were established to be important under the internal risk categories. Under the design risk category, design errors/omissions and design process delays were the most frequently mentioned risk factors

attributed to the contractors [12]. Under the project management risk category, scheduling errors and failure to comply with contractual quality requirements were the most frequently mentioned risk factors. Under the construction risk category, construction cost overruns and technology changes were the most frequently mentioned risk factors attributed to the contractors. Respondents believed that these risk events are responsible for poor quality of work, delays, and associated losses.

According to the methodology proposed by [7], the knowledge of project management is grouped into 9 areas which are as follows:

1. Project Integration Management.
2. Project Scope Management.
3. Project Time Management.
4. Project Costs Management.
5. Project Quality Management.
6. Human Resources Project Management.
7. Project Communications Management.
8. Project Risk Management.
9. Project Acquisition Management.

The Project under study showed the application of the knowledge management areas mentioned above, except for the areas of Risk Management and Quality Management, where the first represents a fundamental factor in the probability of its success [13]. The project developed by the consulting firm does not have a Risk Plan, which is a great weakness for the company. By this and given the requirements and requirements of the organization to want to ensure and guarantee the success of the project, it is imperative to evaluate the risks of consultancy services, before beginning its execution, to guarantee the success and achievement of the objectives posed [14].

Risk Management Planning

To develop the proposed risk plan, the model of the PMI was used as a base methodology, developed around Project Risk Management, which aims to ensure that the project's risks are identified, analyzed, documented, mitigated, and controlled during the project's life cycle. In this phase, the process was raised to manage the risks of the project, which was structured in five phases: planning, identification, analysis, development of the plan of response monitoring, and risk control [15].

Risk Identification

Risk identification is an organized, thorough approach to finding real risks associated with a project. It is not, however, a process of

inventing highly improbable scenarios to cover every conceivable possibility. Risks cannot be assessed or managed until realistic possibilities are identified and described understandably. The key failing of project managers in risk identification is the actual description of risk events. Many project managers attempt to identify risks simply as "schedule" or "cost." [16], (The schedule in and of itself is not a risk.) A risk event is something that may happen to the benefit or detriment of the project.

Qualitative Analysis of Identified Risks

According to [17], Qualitative methods for risk assessment are based on descriptive scales and are used for describing the likelihood and impact of a risk. These relatively simple techniques apply when quick assessment is required in small and medium-sized projects. Moreover, this method is often used in case of inadequate, limited, or unavailable numerical data as well as limited resources of time and money.

As identified by [18] an exemplary range of probability from 'very unlikely' to 'almost certain'; however, the corresponding numerical assessment is admissible. The impact scale varies from 'very low' to 'very high'. By applying the method called risk probability and impact assessment, the likelihood of a specific risk occurring is evaluated.

Development of Plan for Treatment and Response to Risk

Risk response development is a critical part of the risk management process that determines what action will be taken to deal with risk issues assessed in the identification, qualification, and quantification efforts. All information generated to date becomes crucial in determining what the organization will do, that is in keeping with the risks, the organization's tolerance, the project tolerances, and the client's behavior as identified by [19]. To some degree, risk is a cultural phenomenon. Different countries, regions, and organizations have

different traditional tolerances for risk and risk responses. [20] Determining what limits exist early in the risk response planning process is important to ensure that time is not lost on approaches that are unbearable. Risk thresholds are as important here as they are in establishing basic probability and impact for the risks. These risk thresholds should become a component of the risk management plan.

Conclusion

An effective risk management process inspires the construction firm to identify and quantify risks and to consider risk control and risk reduction policies. Construction firms that manage risk effectively and efficiently relish financial savings, greater productivity, improved success rates of new projects, and improved decision-making [21]. According to [22], Qualitative methods of risk valuation are used in construction firms most frequently, ahead of quantitative methods. In construction project risk management, risks may be compared by assigning them to a risk impact matrix against probability. Mitigation options are then derived from predefined restrictions to ensure the risk tolerance and appetite of the construction firm.

Risk management not only helps in avoiding crises but also aids in remembering and learning from past mistakes. This improves the chance of successful project completion and reduces the consequences of those risks [23].

Risk management in the construction industry requires a complementary, interdisciplinary, flexible approach to capture the changing character of risk factors (qualitative, quantitative) as well as a precise description and explanation of the mechanisms

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involved in the organization of construction production. Therefore, in developing a risk assessment model in construction projects it should be emphasized on the compilation of even available and already recognized tools to use a hybrid approach [24].

The purpose of the analysis is to summarize the observations carried out in such a way that they provide answers to the questions of the investigation [25].

The purpose of presenting this work was to identify the Risk Management factors for Project Construction in Civil Engineering firms and their nature in relationship to consultancy services, based on the methodology established. Analyzing the sources of the most relevant risks it was found that most of the risks whose classification belong to the class on High-Risk have their origin of being External Risks or Outer Risk.

Based on the qualitative analysis, a risk listing can now be elaborated, prorating, and selecting only the high and moderate risks that could impact projects, excluding the risks whose classification in the Matrix Probability Impact was low.

Conflict of Interest

I, Latchman Singh declare that there is no financial, commercial, legal, or professional relationship with other organizations, or with people working with them, that could influence this research.

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