International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 05 | May 2020 www.irjet.net p-ISSN: 2395-0072

A Review on Application and Assessment of Risk reserve for Model Development in Risk Mitigation

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Abstract - The construction sector is constantly challenged with the characteristic complexity of projects ,every project is risky, meaning there is a chance that things won't turn out exactly as planned. Project outcomes result from many things, including some that are not predictable and over which project managers have little control. The chance that things turn out differently than expected means that there is uncertainty in projects. The construction sector faces projects that are unique, and thus comparability is difficult. there is both scientific underexposure of and practical wish for a clear framework on the combination of project characteristics, uncertainty and complexity, project`s risk profile and Risk reserve in budgets.

The risk reserve is an important measure in risk management to cope with risks. The actual required risk reserve is thus highly related to risk profile of the project and the characteristics of the specific project. A risk reserve that is perfectly attuned to the specific risk profile increases the probability of project success.

Key Words: Risk reserve, Risk profile, Flood Assessment etc.

1. INTRODUCTION

The construction sector is constantly challenged with the characteristic complexity of projects .Project outcomes result from many things, including some that are not predictable and over which project managers have little control." The chance that things turn out differently than expected means that there is uncertainty in projects. The construction sector faces projects that are unique, and thus comparability is difficult. Consequently, projects become increasingly complex and uncertain. These developments make projects risky and endanger the likelihood of their success.

Research about construction projects showed that there were cost escalations in over 25% of the investigated projects (Flyvbjerg, Holm, & Buhl, 2002). Companies active in the construction sector typically budget a risk reserve to cope for these financial risks in projects. However, there is both scientific underexposure of and practical wish for a clear framework on the combination of project characteristics, uncertainty and complexity, project`s risk profile and Risk reserve in budgets. This problem has resulted in the following main research. The replacement is made only up to certain extent so that this will be affordable due to its additional benefits. One way of managing risks is through allocating contingency budgets and reserved floats in the planning. In the current research, these are called the risk reserve. The risk reserve is an important measure in risk management to cope with risks. The actual required risk reserve is thus highly related to risk profile of the project and the characteristics of the specific project. A risk reserve that is perfectly attuned to the specific risk profile increases the probability of project success. However, there is a lack of ability in science and practice to clearly frame the relations between project characteristics, complexity and uncertainty, project's risk profile and the required risk reserve.

Figure below presents the framework through which all research topics are displayed and is the starting point of this

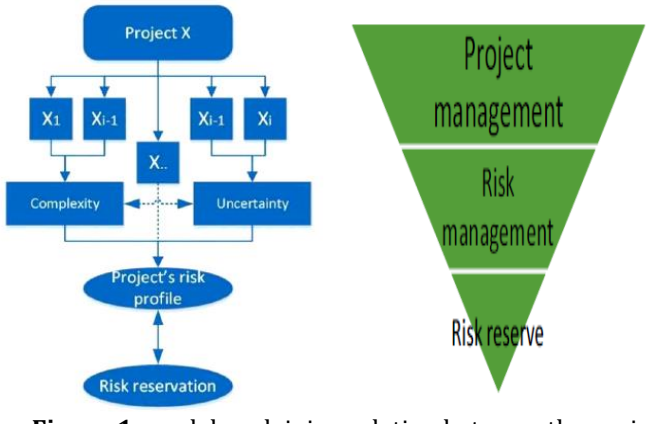

Figure 1: model explaining relation between the project and the required risk reserve

research. Considering this introductory section, the following problem statement is drawn:

2. Literature Review

1 Dena Crnković et.al. (2016) Risk is an integral part of each project phase, and thus risk management is an essential part of the decision-making process at every stage of a project. The success or failure of a project largely depends on the approach to possible risk in which the appearance of risk could affect productivity, quality, deadlines, and/or project cost.

PMBoK defines risk as uncertain event or condition which, if it occurs, can have positive or negative impact on one or more project goals such as scope, cost, schedule, and quality. Risks arise from uncertainty present in every project. Known risks are those risks that are recognized and analyzed, and thus it is possible to plan and prepare a response.

This study considered the problem of understanding and use of risk management methods in construction projects and their representation in the literature and their practical application. Research of trends in risk management was conducted using studies from the EBSCO database that were published in the period from 1999 to 2015. The trend of leading standards in the field of project management, PMBoK and ISO 31000 indicated full support for the modernization of risk management that focused on the risks as well as potential opportunities in the project. The findings also revealed that the global practices continued to lack awareness of risk management and its benefits for project goals. A similar situation was found in Croatia by observing project management practices in two case studies, namely Project Zagrebačka obala in Rijeka and a Project of SEECEL Zagreb. Primarily, the lack of education and communication between experts are important issues requiring attention in practice and academics. It is necessary to gradually introduce standards over time to prepare for progress in managing uncertainties and adopting more holistic approaches.

PMBoK provides five steps to manage risks - planning, identification, analysis, responding, monitoring, and control of project risks.

2. Odimabo Otobo, et. Al. (2016) Risk reserve/flexibility aims to increase responsiveness by adding some reserve (buffer) to cover risks or using redundancy policy. This risk reserved option is suitable for small or medium impact risks.

Risk retention/absorption/acceptance can be called self-insurance, because some risks are not critical so the cost of insuring against those risks may be higher than the cost of the loss if the adverse event happens.

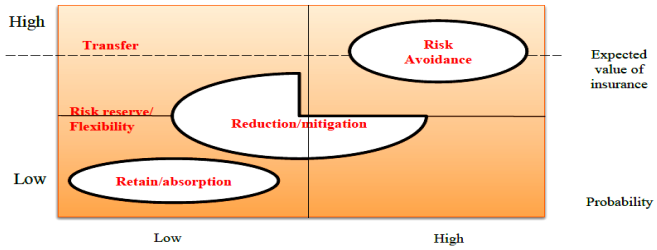

Figure 2: Mapping risk mitigation strategies with levels of probability and consequence

Project risk assessment is an effective tool for planning and controlling cost, time and achieving the technical performance of a building construction project. Construction projects often face a lot of uncertainties, which places building construction projects at the risk of cost, time overruns as well as poor quality delivery. Considering the limited resources of developing countries, there is need to complete building projects on-time, on-budget, and to meet optimal quality hence, risk management is an important part of the decision making process in construction industry as it determines the success or failure of construction projects. In line with this need, this research aims to establish a system to improve the time, cost and quality performance of building construction projects in developing countries, through a comprehensive risk management model that ensures the expectations of clients are met.

The findings from this research were used to establish a risk management system that guides building construction practitioners to improve the performance of building construction projects in Nigeria as well as developing countries, without cost and time overruns while achieving optimal quality. Furthermore, in a building construction project where cost, time and quality really matters, executing a project within the specified budget, time frame and optimal quality is critical, therefore properly implementing a risk management process will enhance the successful completion of building construction projects and thereby making the project more profitable.

3. Yiannis Xenidis, et. Al. (2018) Risk reserves are determined either on an empirical or a regulatory manner as fixed amounts that correspond to a certain percentage of the overall budget. In this way, there is no rational estimation of risk reserves, which may have a critical impact on the potential of success during the tendering process; over-estimated risk reserves may lead to non-competitive offers, while underestimated ones jeopardize the unhindered development of the project.

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Determining the budget is a fundamental process for the development of infrastructure projects for three main reasons: a) it establishes a cost baseline that integrates project scope and quality requirements along with sponsor's funding limits, b) it constitutes a performance measure during the whole project's life-cycle, and c) it affects the competitiveness of the bid. Budgeting and cost estimation methods vary in terms of complexity and accuracy, but, most important, in the way they address contingency reserves in the total budget. The aim of this research is to explore the most applicable budgeting methods for infrastructure projects with regard to the inclusion of risks related costs to the overall budget and demonstrate the capacity of stochastic processes for optimizing overall budgets. Case based reasoning, multiple regression analysis, Monte Carlo simulation and deterministic methods are briefly presented in terms of theoretical approach, requirements, accuracy and integration of risks. Two prevailing budgeting methods, namely the deterministic and Monte Carlo simulation are applied on a real case of reinforced concrete works for a building project; the comparison of the results highlights the two major findings of this research: a) stochastic processes provide more accurate justification of the contingency reserves required for inclusion of risks in budgets of infrastructure projects, and b) stochastic processes are optimum for the definition of realistic contingency reserves that, in turn, results to more competitive bids. The research concludes with the suggestion that stochastic processes should be used for risk based budgeting of infrastructure projects.

Budgeting for infrastructure projects is performed based on methods that fail to address effectively uncertainties and risks. Even though a risk buffer is included to any budget estimation, its value is either empirical or standard based on regulations and common practices; however, it is inaccurate and unreal.

Proper risk based budgeting of infrastructure projects is feasible by implementing a simple Monte Carlo simulation with the help of appropriate software tools. The accurate estimation of risk contingencies results to more competitive bids and more realistic budgets that create a more effective framework for the development of infrastructure projects.

4. Kwang-Pyo Lee et. Al. (2017) According to the PMBOK Guide (A Guide to the Project Management Body of Knowledge, Project Management Institute 2008), a reserve is defined as "a provision in the project management plan to mitigate cost and/or schedule risk." This reserve can be classified into two categories in accordance with the risk characteristics related to their identification and occurrence probability. The first category is the contingency reserve (CR) for the known-unknowns (specific risks relating to a project's threat) identified in planning. The second category is the management reserve (MR) for the unknown-unknowns (emergent risks) that may not be predicted until they occur.

International construction projects normally involve high levels of risk. To reduce such risk, contractors typically include a reserve to mitigate cost overruns and schedule delays. This reserve comprises two categories: (1) a contingency reserve covering potentially required changes, and (2) a management reserve (MR) covering unplanned changes. Since estimating an MR is difficult because the inherent risks are unpredictable, the traditional percentage method is still used for this purpose. To address this shortcoming, this study proposes an MR estimation method based on the cost and schedule performance ratios of international construction projects. K-nearest neighbor (k-NN) is applied to retrieve similar projects and a genetic algorithm is adopted to optimize the retrieved cases. Finally, case studies are conducted to validate the estimated ratios and test the applicability of the proposed MR estimation method. The case study results show that the proposed method can infer the cost and schedule performance ratios within a 5% error rate. As a result, it can estimate the MR more accurately than the traditional percentage method.

This research proposed an MR estimation method using the predicted CPRe (Cost performance ratios) and SPRe (Schedule performance ratios) to deal with the unknown-unknowns of international construction projects. For this, the k-NN classification and GA methodology were applied to develop the proposed MR estimation method by applying attribute-weighted 5-NN. In addition, two case studies were conducted to validate the CPRe and SPRe as well as the applicability of the proposed method. The case studies showed that the proposed method can predict the CPRe and SPRe within a 5% error rate, thus estimating the MR more accurately than the traditional percentage method. In this regard, the estimated MR enables construction companies to cope with emergent risk in the execution phase and can thus be used to plan project costs accurately.

3. CONCLUSIONS

Construction Sector involved numerous activities executed simultaneously which leads to occurrence of various types of risk.

Many approaches has been tried and tested for Risk management. Risk reserve is one of the important tools for managing the risks.

In risk reserve, by future predictions of risks is mitigated by keeping aside separate funds and time to compensate or overcome the risks. In some additional personnel are allowed for mitigation.

The process of reserve is carried out in the planning stage of Project i.e. after preparation of Work Breakdown Structure.

These reserves can be consumed to mitigate the risks when they rise during the any step of project management process.

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