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Faculty of Civil, Industrial and Agricultural Buildings



DOCTORAL THESIS

**Improve Managing Risk Indicator and Cost to
Quantify Strong Building Design**

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BUCHAREST

2019

ABSTRACT

Construction industry has different nature of risks involved as part of the industry. It is mainly because of a complex and highly dynamic working environment with a number of stakeholders. Uncertainties and risks are inherent within the construction industry as compared to other industries. Hence, the process pertaining to planning, execution and most importantly, maintaining different project activities is quite time consuming and highly complex. The complete process requires a number of different people having diversified skill-set together with the coordination based on a vast scale of interrelated and complex activities.

The objectives of this thesis are to determine the factors contributing to the effective risk management for buildings and structures, to evaluate the implications of risk management within the design process for buildings and structures and to scrutinize the key risk indicators in the design of buildings using innovative means. In additional, to assess the positive effects of allocating more budget to the risk management.

Thesis analyses the risk management and cost management of the proposed residential tower if it was implemented in two countries, Iraq and Romania. Based on the analysis of risk management and cost management in Iraq and Romania, for the construction of the residential tower, Romania presents a more feasible and less costly option compared to Iraq. Many risks are involved in Iraq including the high rate of inflation (high cost of construction materials), geological risks (floods and landslides), construction delays (due to a high number of unofficial holidays), implementation of Building Information Modelling as a new technology, and a water shortage problem. For Romania, the risks involved are the shortage of construction workers, geological risks (earthquakes and floods), and poor health and safety procedures. Romania presents a better option for the construction of the residential tower project. Both planned maintenance and unplanned maintenance are recommended for the residential tower. Planned maintenance will look to prevent any failure in the building while unplanned maintenance will aim to repair damaged parts of the building that are already damaged. The cost of buildings designed to resist earthquakes in all respects increase the cost of the proportion little amount, and this percentage cannot be considered effective if compared with the benefits of the building and the first increase the life of the virtual building to double.

Second case study was total of 50 different risk indicators pertaining to different stakeholders are discussed. For the design approach, a G+10 building has been analysed using Staad Pro for identifying and subsequently, addressing them as part of the study. For the risk assessment, a 5x5-risk assessment matrix is used for assigning respective risk rating to different risk indicators.

The determination of key risk indicators show that most of the risks result in the delays pertaining to timelines and hence, increased cost for project completion. Apart from that, the design aspects of structural engineering and infrastructure planning are a quite complex topic that needs significant development. The risk indicators would also provide ample grounds for corrective and preventive actions pertaining to the issues faced by the construction industries.

This thesis added to the existent studies of risk management and the advantages of increased risk indicators in the design of structures. Specifically, it will advocate for the incorporation of risks in the design of structures thus increasing their probability of being robust and durable against the incorporated risks.