Amirkabir Journal of Civil Engineering

Amirkabir J. Civil Eng., 52(5) (2020) 293-296
DOI: 10.22060/ceej.2019.15265.5866

Identifying and Ranking Risks using Simple Additive Weighting method and responding to the most critical risk (Case Study: Mashhad Railway)

M. Asghar khah[1*] , M. Mojahed[1], T. Pasandeh Manesh[2]
[1] Department Name, Islamic Azad University, Shirvan Branch, North Khorasan, Iran
[2] Department Name, Islamic Azad University, Semnan Branch, Semnan, Iran

ABSTRACT: Proper risk identification and management is inevitable for managers, especially in basic projects of the country. It is impossible to implement projects in a risk-free environment, and the consequences of the project will affect the project's three main objectives (time, cost, quality) and usually impose costs for the project. Therefore, considering that the risks of a project are not eliminable but they are distributable, to optimize the objectives of a project, important and critical risks of the project should be identified and ranked, so that we can assign each risk to the employer or the contractors and monitor the consequences. Considering railways of Iran need for maintaining and repairing locomotives, this study introduces a fairly complete set of criteria (probability of occurrence, risk effect and probability of discovery) using multi-criteria decision-making technique and SAW method had been proposed to assess all important risks related to repair- maintenance depot of Mashhad Railway. In this regard, two questionnaires were sent to five experts of Mashhad railway and they evaluate and rank the identified risks through the SAW method, and finally, the risk of delay in construction (lack of comprehensive management system) identified as the most critical risk. Then the best response to the most critical risk was identified through the AHP model using the other questionnaire, which is "employing professional project managers and counselors familiar with management techniques.

Review History:
Received: 2018-11-09
Revised: 2019-01-20
Accepted: 2019-01-25
Available Online: 2019-02-06

Keywords:
Risk Management
Simple Additive Weighting (SAW)
Analytical Hierarchy Process (AHP)
Repair- Maintenance depot of Railway.

1. INTRODUCTION

The construction industry has always been studied as one of the high-risk industries by project management experts. Construction projects are potentially exposed to a variety of risks due to the nature of the activities and processes involved, the organizational structure they seek, and the environment in which they are carried out [1]. Today, executives and designers of construction projects in the country face many problems on their way to achieving their goals; therefore, these projects are not carried out within the framework of estimated cost and time [2].

One of the basic elements of the "scientific management" of projects is risk management. Lack of using risk management methods or tools can face the project with many problems about cost, time and quality [3]. By knowing the problems of implementing projects, past and future risks and risks will be identified, and the importance of the identified risks will be specified by analyzing the qualitative and, if necessary, quantitative analysis, to provide an appropriate response to the most critical of them. In this case, correct and quick decisions can be made during the construction process [4].

This research is an applied research, in which the researcher seeks to design the evaluation and ranking of the identified risks in accordance with the construction project of the maintenance- repair depot of Mashhad railway and is attempting to implement the method which its results will be applied in the future. Moreover, this research has been innovated due to the simultaneous use of simple additive weighting (SAW) method and Analytical Hierarchy Process (AHP) method, and these methods have not been used in railway depot projects so far. Also, in this research, the most critical risk and the most appropriate response to this risk can be used as a basis for future studies and construction projects.

2. METHODOLOGY

This research consists of three areas that are described below:

A. Territory: Geographical location is limited to Mashhad Railways and field studies have been performed for the construction of maintenance – repair depot of the railway. The interviews are largely limited to the main experts of the project, including project managers, consultants, and contractors, as well as several experts in the research process.

B. Time period: The present research was conducted in 2017.

C. Subject: It discusses the issue of identifying the risks of the construction of maintenance- repair depot of Mashhad Railroad, and it seeks to determine the significance of each

*Corresponding author's email: asgharkhahmojtaba286@gmail.com

risk through risk analysis by the Simple Additive Weighting (SAW) method, so that the appropriate response to the most critical risk is determined and the principled decisions can be made correctly and promptly during the implementation process until exploitation.

The research hypotheses that have already been examined or whether they are true are:

1- Risks in the maintenance- repair depot of Mashhad railway project are identifiable.

2- Risks can be prioritized using the SAW technique.

Also, the goals of this study are divided into two main objectives and sub-goals:

A. Main Objectives

Identification and ranking of risks in maintenance- repair depot of Mashhad railway project

B. Sub-goals

1- Identification and extraction of executive risks of railway projects using theoretical studies, expert opinion and documentation review.

2- Identification of criteria in determining the priority of project risks.

3- Weighting and prioritizing identified risks based on SAW model.

3. RESULTS AND DISCUSSION

In this research, theoretical studies and questionnaires have been used in accordance with the research method. With the help of the risk failure structure, experts' comments and project managers in the construction project of Mashhad railroad depot, a list of possible risks that may occur during the project implementation were collected. The list was provided to Mashhad railway managers and experts, and they were asked to identify any risk, the probability of occurrence, the probability of discovery and the impact of the risk (the impact of cost, time, and quality). Then, using different methods (extensive study of risk identification at domestic and abroad projects, studying backgrounds and experiences learned in previous projects, multiple interviews with experts), 100 risks were identified. In the next step, among all identified risks, we rank all risks through the Simple Additive Weighting (SAW) method by using probability of occurrence, probability of discover, and risk impact and the risk of delay in construction (lack of a comprehensive management system) with the highest score Itself identified as the most critical risk.

Now, this risk needs to be responded. After the most critical risk has been identified, strategies to respond to the most critical risk have been developed to address the critical risk. The Hierarchical Analytic Analyzer (AHP) method has been used to respond to this critical risk. In this way, seven criteria and four options are used to determine the appropriate response. Seven criteria are: Suitability of the response, Feasibility of the response, Applicability range, Accessibility, Evaluation of the response, Determination of respondent, and Beneficiaries Consent.

Each of the proposed responses should be tested based on the above seven criteria to ensure that responses will be effective.

Given that the identified risks were ranked and the risk of delay in construction (lack of comprehensive management system) was identified as the most critical risk for the construction of maintenance- repair depot of Mashhad Railway, four responses for the most critical risk were selected as follows:

1- Implementation of the project management system based on the PMBOK standard and its localization in Mashhad Railways using the establishment of the project information management system and holding comprehensive training courses for all project authorities.

2- Employing project managers and advisors who are familiar with project management techniques

3- Force the advisor to employ supervisors familiar with project management in projects and to be mentioned in advisor contract and holding comprehensive project management courses for supervisors.

4- Obligating advisors to hire site managers familiar with the project management techniques and applying these techniques to the implementation of the project and mention this in the contract documents.

The AHP method is used as the decision-making tool to select the appropriate response from the above four selected responses. Questionnaire number 3 was prepared based on questionnaire number 1 and 2 and provided to five experts on the railway. In this way, the criteria for assessing the effectiveness of the responses were compared by paired. Then each response was compared with each effectiveness criteria of the response by paired, which ultimately among four specified responses, "employing strong project managers and advisors familiar with project management techniques" was selected as the best response to the most critical risk.

4. CONCLUSIONS

This research is performed to implement appropriate risk management in Mashhad railway repair depot project. It can play a significant role in reaching to project specified goals.

The following results were obtained in this study:

1. After identifying the risks, the use of the SAW method was proposed to rank the risks. Also, in order to assess and prioritize the risks, questionnaire number one was provided to experts and engineers of the Mashhad railway and the risks were scored. In Questionnaire No. 2, the main criteria were compared by pair, and the experts determined the weight of the criteria. Risks of railway repairing depot of Mashhad railroad was prioritized by the integration of questionnaire number one and two, in which "the risk of delayed construction (lack of comprehensive management system)" was considered as the most critical risk out of 100 identified risks.

2. After identifying the most critical risk through the SAW method, the most appropriate response determined through the Analytical Hierarchy Process (AHP) method, given that the criteria and options are independent. Questionnaire No. 3 was set up to respond to the most critical risk. In this way, seven criteria and four options were compared based on the PMBOK standard using the AHP method. Finally, among the four response options, the option of "employing strong project managers and advisors familiar with project management techniques" was selected as the most critical response to "the risk of delayed construction (lack of a comprehensive management system)".

REFERENCES

[1] M. Hajbagheri, F. Sadeghi, 2010. "Study of risk management in construction industry of Iran", International *conference of project management*, Tehran.

[2] S.Q. Wang, M.F. Dulaimi, M.Y. Aguria, 2004. "Risk Management frame work for construction project in developing countries", *Construction management and Economics*, 22 (12) 237-252.

[3] V. SadeghManesh, 2016. "Safety management in elevator industry using FMEA technique", *Journal of City and Construction*, 98.

[4] R. Mohammad Nejad, 2015. "Identifying and managing risks in construction of second metro lines in Mashhad", *Ferdowsi university of Mashhad*, Mashhad, 56.

HOW TO CITE THIS ARTICLE

M. Asghar khah, M. Mojahed, T. Pasandeh Manesh, Identifying and Ranking Risks using Simple Additive Weighting method and responding to the most critical risk (Case Study: Mashhad Railway), Amirkabir J. Civil Eng., 52(5) (2020) 293-296.

DOI: 10.22060/ceej.2019.15265.5866