Project portfolio selection by considering triple-wise interaction among projects

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Purpose: The project portfolio problem proceeds to choose a subset among the proposed projects in organization. One of the purposes of project portfolio management is the reduction of the available risks in portfolio selection process. In real world, the project risks are rarely independent, and generally have a degree of interaction. By considering this interaction the more accurate evaluation of portfolio selection can be achieved. The purpose of this study is to provide a framework for selecting project portfolios by considering the triple interaction between projects for the first time using the correlation coefficient and the theory of cross-information for the risk factors affecting them.

Design/methodology/approach: First, this research identifies the most critical risks based on the literature review, project management body of knowledge and the relevant experts' opinions. Then, a questionnaire was distributed among 30 experts to quantify the identified risk criteria .The identified risks that are included 11 risks are in the categories of "technical", "external", "organizational" and "project management". Then theses risks are placed in to the "cost", "time" and "quality" classification. By considering the individual project risk, the projects which their risks were higher than the allowable limit, were not able to compete in the portfolio. Also, the pairwise and triple-wise interaction of the projects based on effective criteria caused that the projects which provoke risks synergies in the portfolio to be prevented from being together. By analyzing risks, the pairwise interaction effects between projects are calculated using Spearman's correlation coefficient and for the first time the triple interaction effects between projects are calculated using theory of cross-information to discover more precisely the effect of factors on each other. Finally, the modeling in the form of a case study based on integer linear programming along with two goals, "maximize IRR" and "maximize the number of projects in the portfolio", are accurately assessed to evaluate the research validity.

Findings: The problem of project portfolio is the selection of a subset of proposed projects according to the strategic goals of the organization and the associated constraints. This paper provides a framework for selecting project portfolios by considering the triple interaction between projects for the first time. The results show that considering pairwise and triple-wise interaction instead of individual pairwise interaction comprise different answers. This result leads to discovering the relationship which can not be identified just with the pairwise interaction.

Research limitations/implications: In this research the risk criteria are considered generally, while, in specific projects it can be used specific criteria. Using the meta-heuristic methods when the problem dimensions are increased is another area for future research. In addition, fuzzy methods and stochastic subject in order to quantify the risk criteria could be considered. Besides, this paper

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considers risks with negative aspect for project portfolio selection, while, in future research suggested that the risks with aspect of the positive are considered as well.

Practical implications: One of the most important application of this paper is for project-oriented companies that are involved in doing multiple projects simultaneously. The results of this paper are useful for these companies for risk reduction in selecting and performing their projects.

Social implications: This paper considers the most important risks affecting project execution. These risks include external risks of organization as well as internal and technical risks of organization. So, the paper helps organizations for the most appropriate selection of projects that could have benefits for organization and also society.

Originality/value: In the literature, there are various methods that researchers have considered for risk management. Most of these studies don't consider interactions between projects or simply they considered only pairwise interaction. The main purpose of this study is to consider a higher level of interactions that is triple interactions that not considered in the literature. The results show that considering triple-wise interaction instead of individual pairwise interaction comprise different and better results.

keywords

Project Portfolio, Project management body of knowledge, Triple-wise interaction

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