Available online at www.sciencedirect.com

ScienceDirect

Procedia Computer Science 121 (2017) 646–655

Procedia Computer Science

www.elsevier.com/locate/procedia

CENTERIS - International Conference on ENTERprise Information Systems / ProjMAN - International Conference on Project MANagement / HCist - International Conference on Health and Social Care Information Systems and Technologies, CENTERIS / ProjMAN / HCist 2017, 8-10 November 2017, Barcelona, Spain

A multi-objective fuzzy project selection problem considering social responsibility and risk

Mohammad Khalilzadeh*, Kayvan Salehi

Science and Research Branch, Islamic Azad University, Tehran, Iran

Abstract

This paper present an extended multi-objective project selection (PS) problem with fuzzy parameters. The extended proposed fuzzy PS problem attempts to simultaneously maximize total project benefits and social responsibility, while total risk and total cost are minimized. The social responsibility objective function is considered in this problem for the first time. Moreover, a number of constraints presenting real-world limitations such as logical and resource restrictions are taken into account. The extended model is classified as a fuzzy multi-objective integer programming model. First, the fuzzy parameters are converted to the crisp numbers. Then, a weighted additive fuzzy programming is applied to solve the model. A numerical example is given to illustrate the proposed model. Computational results show that this method is very promising and efficiently achieves quality results for PS problems.

Peer-review under responsibility of the scientific committee of the CENTERIS - International Conference on ENTERprise Information Systems / ProjMAN - International Conference on Project MANagement / HCist - International Conference on Health and Social Care Information Systems and Technologies.

Keywords: Project selection; social responsibility; weighted additive fuzzy programming; Fuzzy parameters

* Corresponding author.
E-mail address: mo.kzadeh@gmail.com

1877-0509
Peer-review under responsibility of the scientific committee of the CENTERIS - International Conference on ENTERprise Information Systems / ProjMAN - International Conference on Project MANagement / HCist - International Conference on Health and Social Care Information Systems and Technologies.
10.1016/j.procs.2017.11.085

1. Introduction

Project selection (PS) problem is one of most important issues in managerial decision making. The main purpose of project selection problem is to select a portfolio of projects that meets the predefined objectives without violating available capital resources. For project selection, the decision maker, or decision makers, has a large set of criteria for selecting projects, which are associated with intangible or conflicting attributes. In the project selection problems, two issues are of particular significance. One is what critical factor and goals should be considered, and the other is what methods can be used to compare and select projects. Regarding the first issue, researchers have considered various factors such as availability of raw materials, machines, human resources and etc. In addition, different objectives such as cost minimization and benefit maximization are considered. In recent years, risk management concepts have received much more attentions among managers. One thing is certain: risk does exist on any project, and it poses either a potential threat or a potential opportunity Risk can cause rework, which means that repeat some activities, which have already been completed, must be repeated. Rework almost always means that there will be schedule delays or additional costs or both. Resources may be retained longer than they had been planned, which could jeopardize other projects as well as cost more money. Risks should be identified first. Then, they are analyzed and assessed.

Risk can be modeled in different methods. In the related literature, risk is generally defined as the multiple of probability that the risk will occur and its impact if it occurs.

Moreover, social responsibility is one of the critical goals that organizations should be considered. Pressures from the NGOs, social communities and media to respect social issues caused a lot of damages to some of well-known corporations. Corporate Social Responsibility (CSR) deals with the effect of corporate activities on different social entities such as job opportunity, human rights, labor safety, etc. [1].

Most researchers have considered only cost and benefit as objective functions in project selection problems. Recently, organizations have paid more attention to social responsibility. Nowadays, with increasing advanced social laws and changing people's attitudes, corporate social responsibility has been considered more than before. Companies can no longer just think of cutting costs and raising their profits. As well as addressing economic issues, they should do their best to ensure their social responsibility. Creating jobs for community members and reducing environmental impacts are examples of corporate social responsibility. These issues should be considered by decision makers in project selection problems. The result of this study can be a guideline for selecting the most suitable projects. Due to the importance of social responsibility, a number of standards such as ISO 26000 have been developed to support the planning and implementing this issue. According to ISO 26000, the social responsibility issues can be classified into seven categories: (1) organizational governance, (2) human rights, (3) labor practices, (4) the environment, (5) fair operating practices, (6) consumer issues, (7) community involvement and development.

A variety of methods have been proposed regarding project selection problem. Several authors have used classical financial techniques such as discounted cash flow. The other group of researchers have employed mathematical models and simulations techniques. In this paper, alongside cost and benefit, risk and social responsibility are considered as objective functions. Due to the conflicts between objective function, the problem is formulated as a multi-objective mathematical programming.

2. Related works

An integrated approach of AHP and LP for maximizing the profitability of selected projects was proposed by Ehie et al. (2016) [2]. Parvaneh and EL-Sayegh (2016) utilized AHP and LP to maximize the profit for project selection problem [3]. The above-mentioned studies applied a single-objective of maximization of company`s revenues. However, the project selection is complicated due to many factors such as profit, cost, risk and so forth. Therefore, the decision maker must simultaneously take several issues into consideration while many of these concerns may conflict with each other that render the problem as a multi-objective programming. Rabbani et.al. (2006) solved a multi-objective mixed integer linear programming model by particle swarm optimization algorithm [4]. Rabbani et al. (2010) presented a comprehensive model for R&D project portfolio selection with 0-1 linear goal-programming [5]. Ghorbani and Rabbani (2009) proposed a new multi-objective algorithm for a project selection problem, considering two objective functions: maximization of total expected benefit of selected projects and minimization of the