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Sensitivity Analysis of Projects Efficiency in a Multi-project Environment Based on Data Envelopment Analysis

Meysam Azimian *[1], Mohamdali Ali Badri [2], Hasan Javadi [3]

[1] *M.Sc. Student. Department of Industrial Engineering, Najafabad Branch, Islamic Azad University, Isfahan, Iran.*
[2] *Assistant professor, Subsea Research and Science Center, Isfahan University of Thecnology, Isfahan, Iran.*
[3] *Researcher, Subsea Research and Science Center, Isfahan University of Thecnology, Isfahan,Iran.*

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ABSTRACT

This paper demonstrates the usage of data envelopment analysis (DEA) for sensitivity analysis of Efficiency Projects in Subsea Science and Technology faculty of Isfahan University of Technology. In this study by considering Earned Value management indexes and also management performances, identical input and output parameters for projects were defined, and data were periodically collected. Then the performances of each project were calculated by DEA method and projects were ordered with respect to their performances. Finally, with sensitivity analysis the importance of each output in performance calculation of Projects were determined. According to the main results, it is possible to use this method for comparing projects' performances, ordering and then imposing sensitivity analysis on effective factors. In this study, an output based model with constant efficiency was used for data analyzing. Furthermore, it is assumed that all the projects in time, cost and acceptable quality are homogeneous. However, results of this research are limited to an exact time and are related to special projects for considered organization. The innovation of this research is due to well defining of new input and output parameters, which is in relation with the projects 'nature in considered organization, and also due to ordering and sensitivity analysis.

1. Introduction

Projects performance assessment is important to achieve employer's satisfaction and their stakeholders in project-based organizations. Because the projects number of such organizations, appropriate and accurate demonstration of projects efficiency and also assessing their performance is one of the main issues of macro management [1]. Performance evaluation can be carried out during project execution that will help to make the right decisions in future and would be very helpful. Project performance assessment for completed projects and at the end can be done, and if there are sufficient and required information and documentations for assessment, it leads to numerous positive effects [2]. So far, several methods have been presented for performance assessment of projects. Among existing methods, the method of application of DEA has growing trend in recent years. All collected observations will be used to measure efficiency in DEA. By making and solving n model, DEA model examines the performance of the n unit. In general, by combining all of the under study units, this method constructs a virtual unit with the highest efficiency and then make a comparison between given unit and other inefficient units [3]. To assessment of projects different researches have been conducted. DEA also has been used in recent years, for example Vinter et al (2006) have considered a set of inputs and outputs for each project and then by using DEA method and a 3-step algorithm to reducing the number of inputs and outputs they have attempted to compare the projects relative efficiency. In fact, their focus was on the combination of project outputs [4]. Chen, Ch. and Lin, M (2006) using DEA approach carried out a case study of R&D performance assessment related to 52 semiconductor integrated companies located in Science and Technology Park in Sin Cho in Taiwan. They evaluated the performance of these 52 companies using the CCR model and also they used BCC model to calculating technical efficiency and scale efficiency. The results show that R&D performance among the evaluated firms is very different and many inefficient firms should increase their economic scales [5]. Lu et al (2008) compared the relative efficiency of projects using input oriented CCR model and defining a set of inputs and outputs as well. They used 3 inputs and 3 outputs in their paper for each Decision making unit [6]. Asosheh et al (2010) have ranked information technology projects by combining DEA and balanced scorecard methods. They used balanced score card as a basic structure to define the projects evaluation criteria and also presented a model for efficient project definition considering cardinal and ordinal numbers [7]. Tavakoli et al (2011) assessed the projects of a R&D organization by combination of DEA and BSC. They presented a combination model of DEA and BSC then compared its results with output oriented CCR model to defense of their proposed model results [8]. Ghapanchi et al (2012) used DEA to select the best examples of information technology projects. They used uncertainty models due to the uncertainty of the variables and the interaction between projects [9]. Despite the works done so far, it seems that no researches have been done on the application of DEA for Sensitivity Analysis of Projects Efficiency. The purpose of this paper is to usage of data envelopment analysis (DEA) for sensitivity analysis of Efficiency Projects. To test the proposed method, available projects in subsea research center affiliated to Isfahan University of Technology were studied. The reason for choosing this center is its project-based feature. In this center, various research and executive projects (R&D) are being conducted simultaneously and assessing their performance is organization

* Corresponding author.
Email address: meysamazimian@yahoo.com