Media selection in the presence of flexible factors and imprecise data

R Farzipoor Saen*
Islamic Azad University-Karaj Branch, Karaj, Iran

This paper depicts the media selection problem through a Data envelopment analysis (DEA) model, while allowing for the incorporation of both flexible factors and imprecise data. A numerical example demonstrates the application of the proposed method.

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1. Introduction

Media selection problem is a major concern in advertising. The marketing department is responsible for managerial decisions related to media selection. As Dyer et al (1992) addressed, the media selection problem is an excellent illustration of a complex multi-faceted decision. A decision model used to handle multiple criteria needs to reflect both cardinal and ordinal data. The media selection problem may be stated as follows: Given a set of media options, and various data regarding the media and the audiences to be reached, which options should be selected.

Data envelopment analysis (DEA), developed by Charnes et al (1978), provides a non-parametric methodology for evaluating the efficiency of each of a set of comparable decision making units (DMUs), relative to one another. In the standard use of DEA, it is supposed that one can, given a set of available factors, clearly determine which factors are inputs and which are outputs. However, in many problem situations, the input versus output status of certain measures can be deemed as flexible. For example, in a conventional study of efficiency of research by universities, ‘research income’ is treated as both an output and input (Cook and Zhu, 2007). Similar arguments can be made regarding the evaluation of third-party reverse logistics (3PL) providers, such as described in Farzipoor Saen (2010). There, ‘ratings for service-quality experience (EXP) and service-quality cedence (CRE)’ are treated as both outputs and inputs (flexible factors). EXP and CRE could serve as either inputs or outputs. From the perspective of decision maker who intends to select the best 3PL providers, such measures may play the role of proxy for ‘high quality of services’, hence can reasonably be classified as outputs. On the other hand, from the perspective of 3PL provider who intends to supply reverse logistics services, they can be considered as inputs that help the 3PL provider in obtaining more customers.

In media selection context, the volume of supplied information to audiences can be considered as a flexible factor. From the perspective of media planner who intends to select the best medium, such measure may play the role of proxy for ‘high understanding of audiences’, hence it can be classified as output. However, this factor can be regarded as an input, because competitors by virtue of high volume of supplied information to audiences get more information about company.¹

As well, in many applications (especially media selection problems), it is necessary to consider the existence of ordinal (qualitative) factors when rendering a decision on the performance of a DMU (medium). Very often, it is the case that for a factor such as medium prestige, one can, at most, provide a ranking of the DMUs (media) from best to worst relative to this attribute. In this situation, the data for certain influence factors (inputs and outputs) might better be represented as rank positions in an ordinal, rather than numerical sense. In certain circumstances, the information available may permit one to provide a complete rank ordering of the DMUs on such a factor. Therefore, the data may be imprecise. Note that there may exist

¹Please note that in traditional DEA, the decision maker decides which criteria are inputs and which are outputs. However, in the flexible factor context, the decision maker is wavered. In other words, the decision maker does not know whether this flexible factor is an input or an output. Therefore, there is a need for a model that determines the status of flexible factor for each DMU, separately. After running the model, the decision maker finds out the status of a flexible factor.