Chapter 1
Classifying the Usage of Multiple Objective Decision Making Techniques in Data Envelopment Analysis

A. Ghazi
Islamic Azad University, Iran

F. Hosseinzadeh Lotfi
Islamic Azad University, Iran

G. H. Jahanshahloo
Kharazmi University, Iran

M. Sanei
Islamic Azad University, Iran

ABSTRACT

There exist a wide range of research studies that apply the Multiple Criteria Decision Making (MCDM) techniques in Data Envelopment Analysis (DEA) methodology and vice versa. Also, MCDM is divided into two subsets, Multiobjective Decision Making (MODM) and Multiattribute Decision Making (MADM). Early studies of DEA methodology utilized the MODM concepts and consequently, most studies in the relationships between MCDM and DEA have involved the usage of MODM techniques in DEA. There remains a large volume of papers in this field; yet, none of them classifies this relationship. Hence, in this research the authors focused on classification of this field that is divided into six groups. Then, some papers in each group are selected for consideration.

INTRODUCTION

Decision making is the study of identifying and choosing alternatives based on the values and preferences of the decision maker. In the mathematical science, optimization is an appropriate tool for making a good choice when confronted with alternative decisions. Decisions often involve several conflicting objectives. Consequently, this has led to optimization under multiple objectives. Multiple criteria decision making (MCDM) and data envelopment analysis (DEA) are two powerful tools in decision making and the management science.

MCDM is associated with structuring and solving decision and planning problems involving multiple criteria (objectives). The problems of MCDM can be classified into two categories, multiobjective decision making (MODM) and multiattribute decision making (MADM). The difference between them is that the former concentrates on decision space, MODM on mathematical programming with several objective functions with continuous decision space, whereas MADM focuses on problems with discrete decision space. Current research is focused on the problems that have an infinite number of alternatives, i.e., MODM. A MODM problem includes a vector of decision variables, objective functions and constraints where decision makers make efforts to optimize the objective functions with respect to the constraints. Multiobjective linear programming (MOLP) is one of the most important forms used to describe MODM problems, which are specified by linear objective functions that are to be optimized under to a set of linear constraints. In multiobjective programming (MOP) problems, the notion ‘efficient’ and ‘Pareto optimal’ is utilized instead of the optimal solution, because there is not a feasible solution to optimize all objective functions at the same times. The most preferred solution (MPS) is an efficient solution that best satisfies the decision maker’s utility function (Hwang & Masud, 1979; Stuere, 1986).

DEA was originally developed within the operations research and management science frameworks. DEA is a nonparametric methodology for performance assessment of decision making units (DMUs) with multiple inputs and multiple outputs. Preliminary, Charnes et al. (1978) offered efficient frontier of production possibility set (PPS) based on the work of Farrell (1957) in the constructing nonparametric productivity function. They assigned an efficiency score to each DMU respect to the distance of it with the constructed efficient frontier. For obtaining the efficiency scores they introduced the mathematical linear programming problems. Now days, the traditional models are improved to satisfy the needs of the decision makers. Traditional DEA models make efforts to make the DMU under evaluation as efficient as possible by assigning favorable weights to inputs and outputs. Therefore, this leads to the varying weights for variables from one DMU to another, which is
Conceptual View on Healthcare Digitalization: An Extended Thematic Analysis
[www.igi-global.com/article/conceptual-view-on-healthcare-digitalization/197440?camid=4v1a](www.igi-global.com/article/conceptual-view-on-healthcare-digitalization/197440?camid=4v1a)

Predictive Modeling of Surgical Site Infections Using Sparse Laboratory Data