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Evaluation of Nurses Performance by Data Envelopment Analysis

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A B S T R A C T

Employee Performance Assessment is a very process-driven process in the organization. Today, the goal is to evaluate the guidance of the staff for team participation to enhance the effectiveness and efficiency of the organization. In this study, Data Envelopment Analysis (DEA) model was used to evaluate units. Nurses were the sample of this study whose information was collected by self-assessment questionnaires. It was six inputs and nine outputs to measure nurses' performance. The nurses of comprise a community of 130 people who completed the questionnaire at random. For data analysis, the data were initially recorded in SPSS software and calculated with DEA solver software. The output of the software is a list of inefficient individuals. How many people with disabilities need to be modeled and suggestions are made to increase the efficiency of people with disabilities.

Keywords: Performance evaluation, Data Envelopment Analysis, Performance, Inefficient, Decision Making Unit.

INTRODUCTION

Performance appraisal is the process by which employees' work is reviewed and formally evaluated at a specified interval. The performance appraisal process is such that the purpose of the appraisal must first be clear to the employee (Andes, Metzger, Kralewski, & Gans, 2002; Bowers & Jinks, 2004; Brahm & de Magalhaes, 2007). Then the criteria, indicators and expectations are understood, then the performance of the individual towards the goals should be measured and benchmarked and proposed by corrective measures and proposed measures. In this research DEA Used(Chen, Gregoriou, & Rouah, 2016; Dyson et al., 2001; Emden, Hutt, & Bruce, 2004; Osman, Hitti, & Al-Ayoubi, 2008; Redfern, Norman, Calman, Watson, & Murrells, 2002).

The DEA stands for Data Envelopment Analysis. A mathematical programming model for the observed data. Provide a new method for empirically estimating weight ratios or efficiency boundaries, such as the production function. Which is the basis of modern economics. Data Envelopment Analysis (DEA) is a mathematical programming method for evaluating General Decision Making Units (DMUs).

Data Envelopment Analysis (DEA) in the evaluation of generating units is based on the assumption that the generating units under investigation employ similar inputs to generate similar outputs. It is linear programming.

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Today, the need for health and high level of service in hospitals is one of the basic needs of individuals. The importance of this issue is to the extent that the extent of a country's development and civilization is measured by the number of hospitals and the level of service it provides. Since the level of quality of service provided in a hospital is by the level of efficiency of nurses and hospital staff It is important to increase the number of people working efficiently and also to increase the efficiency level of people(Finucane, Bourgeois-Law, Ineson, & Kaigas, 2003; Hemans & Abena, 2011; Kingstrom & Bass, 1981; McWilliams & Goldman, 1994; Paradi, Smith, & Schaffnit-Chatterjee, 2002).

This research answers the following questions:

What are the factors affecting nurses' performance in Yazd?

What are the inefficient people in Yazd?

What is the appropriate data envelopment analysis model to identify inefficient and inefficient individuals?

Concept of Data Envelopment Analysis

Data envelopment analysis is one of the best ways to calculate and measure the efficiency of decision-making units (DMUs) considering the efficiency of all decision-making units. The advantage of this method over other methods is that it does not require a specific production function and consequently no parameters are estimated. It can also calculate the efficiency of units separately using two constant and variable return assumptions and present the most efficient ones, ranked(Islam & bin Mohd Rasad, 2006; Johnson & Zhu, 2003; Kemppainen, 2000; Redfern et al., 2002).

Data envelopment analysis is a mathematical programming model for observed data, providing a new method for empirical estimation of weight ratios or efficiency centers, such as the production function, which underlies modern economics.

Data envelopment analysis is based on a series of optimizations using linear programming. Its type of function is not predetermined to satisfy its parameters, so it is a non-parametric method.

In this method, an efficient boundary curve is generated from a series of points determined by linear programming. Two fixed and variable returns to scale can be used to determine points. The linear programming method, after a series of optimizations, determines whether the decision maker unit is on or off the efficiency line. In this way, efficient and inefficient units are separated from each other (Redfern et al., 2002).

METHODOLOGY

A questionnaire was used in this study to collect information. The questionnaire was designed in such a way that the inputs and outputs were initially tabulated and then based on the questionnaire. The first four questions consisted of demographic questions, including gender, marital status, work experience, and education level, and the rest included inputs and outputs [6].

Three hundred questionnaires were randomly distributed among them, and 130 questionnaires were completed by nurses. This questionnaire was designed based on the translation of the model of analysis and evaluation of relative performance of nurses in intensive care units compiled by Ebrahim H. Othman, Lynn N. Barbari, Yousef Sidani, Baida Ayoubi, and Ali-e-Dinjad.

After collecting the questionnaires, they were recorded in Excel and then SPSS software was used to determine the number of outliers that were not available in this research. Cronbach's alpha,

this questionnaire is 0.933. The results of the demographic questions in the questionnaire are as follows:

Table 1. Gender distribution of the sample under study

Gender	Abundance	Percentage
woman	69	54%
man	61	46%

Table 2. Education distribution of the sample under study

Education	Abundance	Percentage
Advanced Diploma	11	10%
Bachelor	83	63%
MA	34	26%
Doctoral	2	1%

Table 3. Work experience distribution of the sample under study

work experience	Abundance	Percentage
Less than 5 years	39	30%
Between 5 and 10 years	51	39%
Between 10 and 15 years	34	26%
More than 15 years	6	5%

Table 4. Marital status distribution of the sample under study

Marital status	Abundance	Percentage
woman	42	32%
man	88	68%

In this research we used DEA SOLVER software to analyze the data.

RESULTS

CCR Model: Performance measurement has always been of interest to researchers because of its importance in evaluating the performance of a company or organization. In 1957, Farrell used a method, such as measuring efficiency in engineering, to measure the efficiency of a manufacturing unit. The object Farrell intended to measure consisted of an input and an output. Cooper and Rhodes developed Farrell's view, developing a model capable of measuring performance with multiple inputs and multiple outputs, known as the CCR model, which is the first letter of the three names. Measure and compare the relative efficiency of organizational units such as schools, hospitals, and bank branches, etc. that have multiple similar inputs and outputs Is. CCR models include fixed-rate models relative to scale. These models are suitable when all units operate at optimal scale.

BCC Model: In 1984, Bunker, Charnes, and Cooper introduced a new model with the change in CCR model, which became known as the BCC model under the first letters of their names. It deals with variable returns relative to scale. Fixed-rate returns models are more restrictive than variable-scale returns models. Because fixed-rate returns include less efficient units and lower efficiency, because this is the case of the "constant-to-scale return" model from the "variable-rate return" model.

CONCLUSION

By examining the software results, we can see that the number of working people in BC models is higher than the number of working people in BC models. Most of the research in the field of performance evaluation uses the BBC model.

In this study, the output-driven BCC method is used because it is not possible to increase inputs in service sectors, but outputs can be easily reduced and increased, thus increasing efficiency.

In both inbound and outbound methods, both models are introduced as inertial units for inefficient units, but for the outbound method, it is defined that each inefficient unit must follow a few percent of efficient reference units.

Given that this study had six inputs rather than outputs to gain performance, when it is called an inefficient unit, it has a low return on some inputs and outputs. Further ways to improve outputs that yield the lower has been offered to increase individual efficiency by increasing these outputs.

We also use the most reference unit method to prioritize efficient units because the number of inputs and outputs is high, and the use of the Anderson and Peterson method and the crossover method requires a large amount of time and computation. In prioritizing efficient units, the one that is more often referred to as the reference unit is ranked higher.

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