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**Evaluation of The Efficiency of Indonesian Education University Using Data Envelopment Analysis During The Year of 2010-2012**

Moch Alip1, Handaru Jati2\*

1Mechanical Engineering Education Department, Universitas Negeri Yogyakarta, Karangmalang 55281, Indonesia

2Informatics Engineering Education Department, Universitas Negeri Yogyakarta, Karangmalang 55281, Indonesia

Improving the efficiency of the Indonesian Education Public University System is a growing need after the implementation of the open market and in the current budget constraint. Economic conditions have led governments to emphasize control and pursue goals of efficiency and productivity in the allocation of public sector resources. This important concern has aimed at educational to bear in mind the evaluation and control of the funding of public institutions and, in particular, of the Universities administrations. In this context, this study has two objectives. First, to evaluate the relative technical efficiency of Indonesian universities by applying the methodology of Data Envelopment Analysis from a sample of 12 Indonesian Education public Universities between 2010/11 and 2011/12 courses. Second, find out if there are significant differences between them in efficiency in terms of certain institutional characteristics. Our findings reveal an acceptable level of average efficiency in the university sector during the period analyzed.

**Keywords:** Technical Efficiency, Indonesian Education, Public University, Open Market, Data Envelopment Analysis

**1. INTRODUCTION**

Universities are learning organizations; its main objectives are to generate, acquire and transfer knowledge; develop and transfer technological innovation; support and challenge current political establishments and support the economy by becoming providers of adequate knowledge and demanded by the workforce in the global market competitions1. However, universities have faced economic difficulties, where the new framework of public accountability has led to the changes in aspects related to their academic, organizational structures and infrastructure.

Some modifications have been carried out within Higher Education Institutions (HEI) are the duration of the academic programs, the average length of time required to obtain a title1, the base process evaluation, planning and reorientation of an activity individual or organizational type2 and greater emphasis on research and

\*Email Address: handaru@uny.ac.id

teaching3. The reason for these changes is to improve the efficiency of universities; i.e. improve their ability to get better results (in terms of graduates, research projects, publications, etc) and more efficient use of resources (financial and human)4.

Efficiency is one of the important aspects that need to be considered when assessing the management processes university. For this process to be effective, it is important to have a system of evaluation to measure the efficiency of the units. Efficiency is the capacity to produce maximum results with minimum resources5. Data Envelopment Analysis (DEA) is also used to assess the efficiency of the 25 best U.S. universities6 and showed that DEA is the correct method for measuring the

efficiency of higher education. DEA method is also used in the calculation of the efficiency of several universities in Norway in 1994, 1995 and 19967. The evaluation way efficiency of universities is essential in the allocation and effective use of educational resources8 for which there is wide variety of measurement techniques parametric and nonparametric (DEA). Institutions of higher education, and nonprofit organizations need to make changes in their organizational structures that lend their decision centers of modern and innovative management techniques that improve resource allocation and effectively contribute to the process of making decisions; able to provide profitability measures with which resources are invested, considering that in those entities, the objectives are not merely economic and profitability concept differs from that used in the business world. As such, it is a relative term: to be established by comparing dependencies or a pattern. A method to quantify the efficiency is data envelopment analysis (Data Envelopment Analysis or DEA). This technique has its origins in the article Charnes, Cooper and Rhodes9 and is based on the notion of relative efficiency introduced by Farrell10. Because of this reason the work of the efficiency of Indonesian Education Universities in the year between 2010-2012 is analyzed, using the DEA.

This paper is organized as follows. In the first section the overall picture of the education sector which requires public universities to improve their performance is presented. In the second section the concepts, types and methods of estimating efficiency is indicated, the methodology adopted follows, referring to the model, sample inputs (inputs) and products (outputs) used. The results obtained are shown in the third section. Finally, this report will be ended with conclusions and recommendations.

**2. CONSEPTS, TYPES, AND METHODS**

Methodology consists of four phases: In the first phase of field research and documentation to obtain database and concepts, theories, and background relevant to the measurement of efficiency via DEA. In the second phase the variables objects of study are chosen in response to the data. In the third phase of the data processing it is done. Subsequently, in the fourth phase, analysis of the results is made and the conclusions of the investigation are made. The data used in this work are: (1) the number of student, (2) the number of academic staff, (3) the number of administration staff, (4) the amount of university funding, (5) the number of study program, (6) the number of Doctor, (7) the number research funded, (8) the number of journal and book published, (9) the number of community service, (10) the number of graduated student during one academic year (11) the number of accredited study programs, and (12) the number of patent. All of the data were taken from the Institution Accreditation Report for year 2010, 2011 and 2012 and University annual report. In this study The DEAP software has been used because this software has an output orientation and it is well known that the orientation employed affects the results in terms of returns to scale11, 12. Efficiency values ​​are calculated using the CCR model developed by oriented Input.

**3. INTERPRETATION OF THE RESULTS**

Figure 1 below shows data imputed in the EMS software that were obtained from official sources about the input and output variables needed in the assessment of the efficiency of a university.



Fig 1. User Interface of EMS Software

Table 1 shows an example of the information obtained in field research and documentary data entry software in the columns headed-Variables of the input and Variables of the output. Calculation to obtain the level of efficiency of the University Education in Indonesia performed using EMS software and this software capable in calculating several types of DEA method. The twelve variables are the basis for the calculations, and those are the number of student, the number of academic staff, the number of administration staff, the amount of university funding, the number of study program, the number of Doctor as the input while the number research funded, the number of journal and book published, the number of community service, the number of graduated student during one academic year, the number of accredited study programs, and the number of patent as the output.

Table 1. Values of the efficiency for 2010-2010 and 2011-2012

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No | DMU | 2010 | 2011 | 2012 | Mean | Rank |
| 1 | UNIMA MANADO | 89.3% | 73.3% | 97.7% | 86.8% | 11 |
| 2 | UNDHIKSA SINGARAJA | 92.99% | 72.27% | 84.71% | 83.32% | 12 |
| 3 | UNIMED MEDAN | 107.48% | 99.18% | 59.90% | 88.85% | 9 |
| 4 | UNG GORONTALO | 98.78% | 141.46% | 112.41% | 117.55% | 6 |
| 5 | UNM MAKASAR | 130.68% | 87.77% | 124.66% | 114.37% | 7 |
| 6 | UNESA SURABAYA | 65.29% | 169.00% | 122.32% | 118.87% | 5 |
| 7 | UNJ JAKARTA | 115.59% | 188.89% | 148.58% | 151.02% | 4 |
| 8 | UM MALANG | 220.79% | 272.21% | 184.68% | 225.89% | 1 |
| 9 | UNNES SEMARANG | 79.81% | 97.66% | 84.05% | 87.17% | 10 |
| 10 | UNY YOGYAKARTA | 290.54% | 105.91% | 99.36% | 165.27% | 2 |
| 11 | UPI BANDUNG | 170.22% | 182.59% | 134.41% | 162.41% | 3 |
| 12 | UNP PADANG | 87.03% | 113.75% | 108.50% | 103.09% | 8 |

All universities that do not have the level1 of efficiency should strive to be efficient in a way: reducing inputs while maintaining a constant output (this is an input-oriented approach), increase output while maintaining a constant input (this is an output-oriented approach, or a third model which seeks to reduce input and increase output.

From the calculation results in Table 1 shows that Universitas Negeri Malang, Universitas Negeri Yogyakarta, Universitas Pendidikan Indonesia, and Universitas Negeri Jakarta are the universities with the highest efficiency rating in Indonesia (more than 150%). First, the efficiency of the Indonesian education universities occurs during the period 2010-2012 showed slight progress (see table 1). In Table 1 it can be seen that in the period 2010/2011 there are 7 DMU presented progress on their level of efficiency while in 2011/2012 only 3 DMUs. However, in the period 2010-2012only DMU 7,8, and 11 have level of technical efficiency more than 1. Also noteworthy was the most stable behavior present level technical efficiency of the DMU 11, since these levels throughout the period 2010-2012 remained in the level of around 1.4 – 1.8. On average, it can be noted that more than a half of the DMUs analyzed presented progress, as their average efficiency indices were higher than the 1. Within this majority group, the DMUs 8 and 10 were the best evaluated. Their level indices technical efficiency were 225.89% and 165.27% respectively.

**4. CONCLUSIONS**

The main objectives of universities are: acquire, build and transfer knowledge. As learning institutions, seek to develop and transfer innovation technology, making contributions to existing political systems, and offer advances and training to the workforce, in order to promote economic growth. Therefore, universities (public), like other organizations (Public and private) can be considered as social entities that are inserted into a spacious environment, which forces them to adapt to major changes economic and social predominant. Thus, the growing concern for issues concerning the quality of services provided by the public education sector has place performance (technical efficiency) is constantly evaluated, using the use of various techniques, such is the case of nonparametric frontier method known as data envelopment analysis (DEA), which measures the technical efficiency of DMUs. The DEA measures the performance of DMUs statically (calculated efficiency technique at a given time). More than a half of the DMUs analyzed presented progress, as their average efficiency indices were higher than the 1. The DMUs 8 and 10 were the best evaluated. Their level indices technical efficiency were 225.89% and 165.27% respectively

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**REFERENCES**

1. M. Katharaki, and, G. Katharakis,. A comparative assessment of Greek universities’ efficiency using quantitative analysis. *International journal of educational research*, *49*(4), pp.115-128. (2010)
2. A.D. Athanassopoulos and, E. Shale,. Assessing the comparative efficiency of higher education institutions in the UK by the means of data envelopment analysis. *Education Economics*, (1997) *5*(2), pp.117-134.
3. J.C. Glass, , G. McCallion, , D.G. McKillop, , S. Rasaratnam and, K.S. Stringer,. Implications of variant efficiency measures for policy evaluations in UK higher education. *Socio-economic planning sciences*, (2006) *40*(2), pp.119-142.
4. T. Agasisti and, G. Johnes,. Beyond frontiers: comparing the efficiency of higher education decision‐making units across more than one country. *Education Economics*, (2009) *17*(1), pp.59-79.
5. B. Sander and, T. Wiggins. Cultural context of administrative theory: In consideration of a multidimensional paradigm. *Educational Administration Quarterly*, (1985) *21*(1), pp.95-117.
6. T.M. Breu and, R.L. Raab,. Efficiency and perceived quality of the nation's “top 25” National Universities and National Liberal Arts Colleges: An application of data envelopment analysis to higher education. *Socio-Economic Planning Sciences*, (1994) *28*(1), pp.33-45.
7. F.R. Førsund and, K.O. Kalhagen,. *Efficiency and productivity of Norwegian Colleges* (1999) (pp. 269-308). Deutscher Universitätsverlag.
8. C.T. Kuah and, K.Y. Wong,. Efficiency assessment of universities through data envelopment analysis. *Procedia Computer Science*, (2011) *3*, pp.499-506.
9. A. Charnes, , W.W. Cooper and, E. Rhodes,. Measuring the efficiency of decision- making units. *European journal of operational research*, *3*(4), p.339. (1979)
10. M.J., Farrell. The measurement of productive efficiency. *Journal of the Royal Statistical Society. Series A (General)*, (1957) *120*(3), pp.253-290.
11. R. Fare, , S. Grosskopf and, C.K. Lovell,. *Production frontiers*. Cambridge University Press. (1994)
12. L.M. Seiford and, J., Zhu. An investigation of returns to scale in data envelopment analysis. *Omega*, (1999) *27*(1), pp.1-11.

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