Chapter 5

5.0. CONCLUSION

5.1. Summary

This study is aimed at measuring the relative efficiency of public universities in Malaysia in 2001 by employing Data Envelopment Analysis (DEA). Specifically it attempts to derive a comprehensive measure of performance in order to identify the best practice universities. The DEA models developed utilized a single input variable, i.e. operating expenditure and three output variables comprising number of student enrolments, publication counts and research income. The data on operating expenditure and student enrolments were obtained from the Department of Higher Education, Ministry of Higher Education. Whereas both data of publication counts and research income were obtained from MASTIC of Ministry of Science, Technology and Environment.

The efficiency measurement also point out the areas to be improved by the universities, for example, research. Data Envelopment Analysis (DEA) is a technique where it can handle multiple inputs and outputs without the need for prior weights for aggregating inputs and aggregating outputs. Four models are developed to evaluate the efficiency of the group of 15 public universities in Malaysia for the academic year 2001/2002. These models were run in the input minimization orientation and with the assumption of constant returns-to-scale. The results generated by the most comprehensive model i.e. DEA3 depicted five universities ranked at the top of the list scoring the 100% rating. The universities are UM, USM, KUSTEM, UTM, and UiTM.

In this concluding chapter, it is to be highlighted that it is possible to do more than just to identify the relevant input and output measures and generate efficiency scores. We will attempt to examine the results and come out with more general observations on these universities. We will also put forward some recommendations on the future direction of this research.

5.2. Recommendations and implications.

5.2.1. Potential cost reduction

When a university has been identified as benchmark or cost-efficient referent peer, it is important for other inefficient universities to identify the area in which these efficient universities may provide an example of good practice for other universities to follow (Casu & Thannassoulis, 2003). Based on the cost-efficiency scores, it is possible for the inefficient universities to estimate their operating cost reduction that they should be able to attain if they were to run their operations efficiently.

The results of the most comprehensive DEA model in this study, DEA3, is examined to estimate the potential operating cost reduction of the inefficient universites. For instance, UKM scores an efficiency level of 64.54%. UKM could actually reduce its operating expenditure by 35.46% without reducing its number of student enrolments and research output for it to be fully efficient. The actual amount of cost reduction can be computed by multiplying the percentage of cost savings with the actual amount of operating expenditure for UKM. For each of the inefficient universities under consideration, the potential cost reduction is presented in terms of the percentage of savings, which are derived similarly. Table 5.1 below depicts the potential operating cost reduction for inefficient universities.

Table 5.1

Potential Percentage Operating Cost Reduction for the inefficient universities

University	Efficiency Score	Potential Efficiency Savings
UM	100.00%	0.00%
USM	100.00%	0.00%
UKM	64.54%	35.46%
UPM	79.06%	20.94%
UTM	100.00%	0.00%
UUM	92.95%	7.05%
UIAM	29.74%	70.26%
UNIMAS	31.63%	68.37%
UMS	50.24%	49.76%
UPSI	56.00%	44.0%
UiTM	100.00%	0.00%
KUSTEM	100.00%	0.00%
KUIM	20.60%	79.40%
KUiTTHO	35.67%	64.33%
KUTKM	2.12%	97.88%
Average Score	**64.17%**	**35.83%**

Table 5.1 above reveals that UIAM, UNIMAS and the other three college universities, KUIM, KUiTTHO and KUTKM have a considerably huge potential reduction on their operating cost. However, it is noteworthy that the three college universities are "young" education institutions (established in 1998 – 2000), hence, they have not been able to produce significant teaching and research outputs.

The efficiency scores of Table 5.1 reveal a considerable inefficiency in the teaching and research operations of these universities. Table 5.1 also depicts the efficiency scores for all universities average to 64.17%. Hence, an average inefficiency score of 35.2% display by the universities reflects the considerable scope for efficiency savings.

The potential amount of cost reduction can be obtained by multiplying the percentage of potential cost reduction for each university with the amount of its operating expenditure. From this study, it was found that as much as RM480,994,814 of the total operating expenditure incurred by all universities within this group could be reduced, without the detriment to the teaching and research output produced.

5.2.2. Other areas of improvement

Identifying ways to improve performance is another objective of the DEA implementation. We can gain some insights for this by examining the DEA results on weights and benchmarks. The frequency of UM and KUSTEM chosen as benchmarks enlightened us with the general patterns of activities of universities in this study. KUSTEM has the highest frequency for its benchmark across all models which is reflected by Table 4.8 of Chapter 4 page 70. The allocation of weights in DEA3 presented in Table 4.9 of the same chapter (page 71), illustrates that both universities UM and KUSTEM have two different emphasis on their weights allocation. While UM put greater emphasis on research, KUSTEM has more weights allocated for student enrolment numbers. If the majority of the inefficient universities under study are benchmarking KUSTEM, impliedly, these universities have a greater inclination towards producing student numbers rather than research.

Table 5.2

Reviewed EMS results on Teaching and Research Output of the universities

DMU	Efficiency	TEACHING OUTPUTS			RESEARCH OUTPUTS			REFERENT PEERS
		StEPG	StUG	Total	ICPUB	RI	Total	
1. UM	100.00%	0.32	0	0.32	0.63	0.04	0.67	-
2. USM	100.00%	0	0	0	0.06	0.94	1.00	-
3. UKM	64.54%	0.41	0.22	0.63	0.22	0.15	0.37	UM, UTM, KUSTEM
4. UPM	79.06%	0.71	0.14	0.85	0	0.16	0.16	UM, KUSTEM
5. UTM	100.00%	0	0	0	0	1	1.00	UKM
6. UUM	92.95%	0	1	1	0	0	0.00	KUSTEM
7. UiAM	29.74%	0.74	0.24	0.98	0	0.02	0.02	UM, KUSTEM
8. UNIMAS	31.63%	0	0.55	0.55	0.45	0	0.45	UM, KUSTEM
9. UMS	50.24%	0	0.77	0.77	0.23	0	0.23	UM, KUSTEM
10. UPSI	56.00%	0	1	1	0	0	0	KUSTEM
11. UiTM	100.00%	0	0.03	0.03	0	0.97	0.97	-
12. KUSTEM	100.00%	0.43	0.51	0.94	0	0.06	0.06	-
13. KUIM	20.60%	0	1	1	0	0	0	KUSTEM
14. KUiTTHO	35.67%	0.65	0.35	1	0	0	0	UM, KUSTEM
15. KUTKM	2.12%	0	1	1	0	0	0	KUSTEM

Table 5.2 illustrates some evidence on a full weight (1.00) being assigned for teaching outputs (StUG and StEPG) which is the sole contributor to the efficiency scores of UUM, UPSI, KUIM, KUiTTHO and KUTKM. These universities allocate a weight of zero to research output indicating their weak performance in this area. Despite being the new players in the higher education industry, KUIM, KUiTTHO and KUTKM need to start working on research activities in order to be efficient in both areas teaching and research. Similarly, it is very crucial for UUM and UPSI to embark upon research and publication so as to improve their level of efficiency.

UPM, UiAM and UMS should also improve on their research productivity to achieve a balance with their teaching outputs. The research performance of all universities under consideration has been assessed separately by model DEA4 which includes only the research activities as the output and dropping the teaching activities.

The results of DEA4 in Table 4.6, page 66 of Chapter 4 illustrate the same findings. A large numbers of them are underperforming in terms of research. Put another way, this study has demonstrated that many universities are over-resourced in the area of research. The mean research efficiency score of 37.8% revealed by DEA4 indicates the need for efficient use of resources towards increasing the number as well as quality of research work within these universities. Universities need to publish their research works. Publications not only attract the required quality of undergraduates and postgraduates research students, but also attract funding mix of public and private contributions (NST, 2004).

5.2.3. Policy Implications

In this final analysis, we can draw two policy implications on the higher educations performance measurement and funding decision.

First is the need for the universities in Malaysia to implement a centralized system which would enable them to compile a complete and reliable set of data on teaching as well as research activities. Thus, there is also a need for defining indicators of research report to measure the research performance of IHLs in Malaysia.

A well-designed information system could be the answer to manage voluminous data and information. In addition, the execution of a DEA could only be successful with the availability of appropriate and consistent data (Johnes & Johnes, 1995). Often, it is the non-availability of complete and reliable data which pose as the major hindrance to a comprehensive DEA study.

The second policy implication is the need to put in place a performance-based allocation of funding for the universities in Malaysia. The issues concerning public higher education performance measurement have been raised in Chapter 1 page 6. Two points highlighted are the importance for an efficient use of limited public funds available and the future reduction in the public funding figure for the Malaysian public IHLs,. A performance-based measurement would give an insight into aid the public funding decisions which is more transparent and inevitably spur greater efficiency and quality. A performance-based allocation of funding could also act as a catalyst to further enhance the research activities to be conducted. Funds from home as well as from abroad are requisite for research and operations of the universities. IRPA of MOSTE is playing a very important role in triggering a surge in research which will result in increased publications of the public universities (NST, 2004).

5.3. Perspectives on the current issues

Chapter 1 of this study highlights the need for public universities to become even more accountable. Measures to ensure quality assurance have been undertaken within these public universities (Maidin, 2004). Nonetheless it is difficult for the government, sponsorship bodies, and future employers to ascertain whether these public universities meet the desired targets .The nation is currently hit with problems of high unemployment amongst university graduates. The result of a survey on the employability and marketability of universities graduates conducted by MIER last year was alarming. 46.2% of public universities graduates were unemployed in 2003 (MIER, 2004). This fact should alarm government and the loan-sponsorship bodies since the majority of public universities graduates receive some form of loan scholarship .This high unemployment would definitely result in problems with loan repayment. The shrinking educational funds, will inevitably, jeopardize the chances of new students in securing loans or scholarships. This vicious circle could lead to the deterioration of IHLs functions.

Public IHLs have to start somewhere. Even private IHLs recognize that rating is the way forward (StudyMalaysia.com, 2003). Performance measurement is the upcoming trend and universities should be more proactive. This study attempts to show that DEA based approach can be effectively utilized by public universities.

5.4. Contributions of the study

There are four major contributions derived from this study in relation to the efficiency of Malaysian public universities. They are laid down as follow:

- Define the set of performance indicators to be employed in the execution of Data Envelopment Analysis.
- Measure the relative teaching and research efficiency of the Malaysian public universities
- Explore the potential areas of improvement, in particular, the potential savings in the operating cost for the inefficient universities.
- Identify two policy implications with regards to the need for a centralized system to enable the universities to compile a complete and reliable set of data, and the need for a performance-based funding allocation.

5.5. Future Direction

A DEA-based performance analysis provides a much more reliable comparison than other forms of performance measurement. This is because universities can identify their standing relative to their peers, and assess their performance from the results generated (McMillan *et al*, 1998). Henceforth, more DEA studies on Malaysian public higher educations should be undertaken. There are a few factors concerning DEA study that needs consideration. The first three focuses on the technical aspects of DEA as a performance measurement tool, while the last two acquaint the policy makers with extended features of DEA worth considering.

- The models discussed in this study are under the assumption of CRS. While this assumption is legitimate, it is not always appropriate in a real life context. (Thannasoulis, 2001). In situations where CRS does not prevail, it is important to compare universities based on their scale of operations, on which the most general assumption is to make a comparison under VRS. The next study which ought to be conducted should be universities' performance assessment under VRS.

- The definition of input and output data is crucial. This should be made according to efficiency perspectives (Hussain *et al*, 2000). For this, the construction of Performance Indicators (PIs) for the operation of higher education systems must be implemented. This should be a comprehensive set to cover all areas of teaching and research by taking into account the quality issues of each variable. Other indicators demanding consideration are student to staff ratio, the dropout rate of students and most importantly, the employment rate (Avkiran, 2001). Employment rate denotes graduates who have successfully secured jobs upon graduation. DEA framework may consider assessing the performance of universities from this perspective.

- Every university must allocate some weight to all inputs and outputs defined. They cannot, at will assign inappropriate output and input factor to achieve higher efficiency scores. One method of rectifying this problem is to impose weight restrictions. Weight restrictions allow for the integration of managerial preferences in determining the relative emphasis to be placed of various input and outputs. Higher level DEA studies incorporating weight restrictions are evident in many DEA studies abroad (for instance Charnes et al, 1990, Wong and Beasley, 1990)

- DEA would be a more appropriate tool for policy making and the management of public universities if the study was conducted over a period of time. The findings of study over the period of comparison will give a better efficiency measurement of a higher academic institution. Moreover, studies can be conducted to examine the consequence arising from the implementation of new education legislation. For example, studying the impact Private Higher Education Institution Act (1996) has towards the efficiency level of the public universities.

- DEA should also be utilized as a resource allocation tool, (Bessent et al , 1983). A more detailed study could lead to a report describing the best practice universities and further recommendations.

DEA approach may be a useful tool as it guides and direct the policy makers on how to allocate public funding amongst public universities. As stated by Johnes and Johnes (1995), DEA is not a panacea. It cannot answer impossible questions, but it can, however, offer means to alleviate the difficulties encountered.