

Appendices

Appendix 1.1
Public Universities in Malaysia and the year of establishment

University	Year of Establishment
Universiti Malaya (UM)	1962
Universiti Sains Malaysia (USM)	1969
Universiti Kebangsaan Malaysia (UKM)	1970
Universiti Teknologi Malaysia (UTM)	1972
Universiti Putra Malaysia (UPM)	1984
Universiti Utara Malaysia (UUM)	1992
Universiti Malaysia Sarawak (UNIMAS)	1994
Universiti Malaysia Sabah (UMS)	1997
Universiti Pendidikan Sultan Idris (UPSI)	1997
Universiti Teknologi MARA (UiTM)	1999
 <u>College University</u>	
Kolej Universiti Islam Malaysia (KUIM)	1998
Kolej Universiti Sains dan Teknologi Malaysia (KUSTEM)	1999
Kolej Universiti Teknologi Tun Hussein Onn (KUiTTHO)	2000
Kolej Universiti Teknikal Kebangsaan Malaysia (KUKTM)	2000
Kolej Universiti Kejuruteraan Utara Malaysia (KUKUM)	2002
Kolej Universiti Kejuruteraan & Teknologi Malaysia (KUKTEM)	2002
 <u>International University</u>	
International Islamic University Malaysia (IIUM)*	1983

Source: Education Guide MALAYSIA (2004)

* Considered as a public university in this study as being government-funded.

Appendix 1.2

Some Examples of Private Higher Education Institutions (PHEIs) in Malaysia established in the three generations.

<u>The First Generation (established in and prior to the 1980s)</u>	<u>Year of Establishment</u>
Stamford College	1950
HELP Institute	1986
Inti College	1986
Sedaya College	1986
Kolej Damansara Utama (KDU)	1983
Sunway College	1987
Metropolitan College	1986
<u>The Second Generation (established during 1990-1995)</u>	
Lim Kok Wing of creative Technology (LICT)	1991
International Medical College (IMC) – promoted to International Medical University (IMU) in 1998	1992
L&G Twintech Institute of Technology/ Twintech College	1994
Kolej Bandar Utama (KBU)	1990
<u>The Third Generation (established/registered since post legislation period starting 1996)</u>	
Multimedia University (MMU)	1997
Monash University Malaysia	1998
Pusat Teknologi Pengurusan Lanjutan (PTPTL)	1997
Kolej Islam Darul Ehsan Selangor (KISDAR)	1996
Institut Teknologi Cyberjaya	1998

Source: Tan Ai Mei (2002) Malaysian Private Higher Education – Globalisation, Privatisation, Transformation and Marketplaces. ASEAN Academic Press

Appendix 2.1
Data Envelopment Analysis (DEA) Efficiency Measurement applied to Higher Institutions of Learning.

Author & Year	Country & Sample	Methods	Inputs	Outputs	Main conclusion
1. Ahn, T., Charnes, A., & Cooper, W.W. (1988)	161 Public & Private Doctorate-granting institutions Data: 1984-1985	DEA	<ul style="list-style-type: none"> • Instructional Expenditures • Physical Investments • Overhead Expenditures 	<ul style="list-style-type: none"> • Fulltime Undergraduate Enrollment • Fulltime Graduate Enrolments • Federal Research Grant. 	Efficiency Scores for both public & private universities are generally at its fullest. Public institutions without medical schools are more technically efficient than private institutions without medical schools
2. Johnnes, G. & Johnnes, J. (1993)	36 UK University Economics departments. Data: 1984-1988	DEA	<ul style="list-style-type: none"> • Teaching/Research Staff • Research-only staff • Per capita research grants • Undergraduate student load 	<ul style="list-style-type: none"> • Papers and letters in academic journals • Articles in professional and popular journals • Authored and edited books • Published works • Edited works. 	Small degree of sensitivity of DEA to changes in input-output specification.
3. Johnnes, G. & Johnnes, J. (1995)	36 UK University Economics departments. Data: 1984-1988	DEA	<ul style="list-style-type: none"> • Teaching/Research Staff • Research-only staff • Per capita research grants • Undergraduate student load 	<ul style="list-style-type: none"> • Papers and letters in academic journals • Articles in professional and popular journals • Authored and edited books • Published works • Edited works. 	Allotiances should be made for differences in the inter-departmental allocation of variable inputs.
4. Beasley, J.E. (1995)	32 UK Chemistry and Physics university departments. Data: 1989	DEA	<ul style="list-style-type: none"> • General and Equipment Expenditure 	<ul style="list-style-type: none"> • Research Income • Index of departmental research quality. • No. of Undergraduates. • No. of taught and research postgraduates. 	DEA proved to an effective tool in determining teaching and research efficiencies when resources are shared between activities.

Appendix 2.1
Data Envelopment Analysis (DEA) Efficiency Measurement applied to Higher Institutions of Learning - (Continued).

Author & Year	Country & Sample	Methods	Inputs	Outputs	Main conclusion
S. Coelli, T. (1996) 36 Australian Universities Data: 1994		DEA	<ul style="list-style-type: none"> • Academic Staff Numbers • Non-academic Staff Numbers • Total Staff numbers • Non-staff Expenses • Administration Staff Expenses • Other Administration Expenses • Other Expenses 	<ul style="list-style-type: none"> • Student Numbers • Publication Index • Total Staff Numbers 	<p>Both technical & scale efficiency for university model are relatively high (>95%)</p> <p>Mean technical and scale efficiency for academics model is slightly lower than university model</p> <p>Both technical & scale efficiency for administration model are markedly lower than the other two models.</p>
Andreas D. Anthanassopoulos & Estelle Shale, (1997)	52 UK Higher Institutions. Data: 1992	DEA	<p>Cost Efficiency Model</p> <ul style="list-style-type: none"> • General Academic Expenditure • Research Income <p>Outcome Efficiency Model</p> <ul style="list-style-type: none"> • No. of FTE undergraduates • No. of FTE postgraduates • No. of FTE academic staff • Mean A-Level entry score • Expenditure on library & computing service • Research Income 	<ul style="list-style-type: none"> • No. of Successful Leavers awarded • Weighted research rating • No. of Successful Leavers • No. of higher degrees awarded • Weighted research rating 	<p>High output cost efficiency does not equate to low unit cost.</p> <p>Teaching and research coexist and interact.</p> <p>Many inefficient DMUs were over-resourced in research area.</p>
Gary Madden & Scott Savage (1997)	Economics Department of 24 Australian Universities Data: 1987-1991	DEA	<ul style="list-style-type: none"> • No. of Teaching Staff • No. of Research Staff 	<ul style="list-style-type: none"> • Number of Graduating Undergraduate Students • Number of Graduating Postgraduate Students • No. of Publications – Economic journals, non-economic journals, authored books, contributions to edited books; occasional papers, discussion, conference papers & research reports 	<p>As the result of HES policy, there were substantial reductions in the inefficiency within the economic departments of the university group under evaluation.</p> <p>However, not solely due to governmental funding policy, other affecting factors were expansion of research fellowship scheme, provision of extra postgraduate research awards & greater reliance on external funding.</p>

Data Envelopment Analysis (DEA) Efficiency Measurement applied to Higher Institutions of Learning – (Continued).

Appendix 2.1

Author & Year	Country & Sample	Methods	Inputs	Outputs	Main conclusion
8. Melville McMillan & Debasish Datta, (1998)	45 Canadian Universities. Data: 1992-1993	DEA	<ul style="list-style-type: none"> • No. of total full-time faculty in professional ranks • No. of full-time faculty eligible for MRC & NSERC grant • No. of full-time faculty eligible for SSHRC & Canada Council grant • Total expenditure less faculty salaries & benefits. • Total operating expenditure & sponsored research expenditure 	<ul style="list-style-type: none"> • No. of total undergraduate enrollment. • No. of female undergraduate enrollment in science • No. of undergraduate enrollment other than science enrollment • No. of total female graduate enrollment • No. of graduate enrollment in master program • No. of total graduate enrollment in doctoral program • Total sponsored research expenditures. • % of active SSHRC & Canada Council grants • % of active MRC & NSERC Council grants 	<p>Overall efficiency scores are relatively high.</p> <p>Competition from nearby universities, program specialisation, and total enrollment increase efficiency of the Canadian universities</p> <p>Universities that input efficient are not always cost efficient</p>
9. Ying Chu Ng & Sung Ko Li, (2000)	China, 84 Chinese Higher Education Inst. Data : 1993 - 1995	DEA	<ul style="list-style-type: none"> • No. of Researchers • No. of Research Support Staff • Budget Funds 	<ul style="list-style-type: none"> • No. of Manuscripts • No. of Articles • No. of Recognized research outputs • No. of Contracts • No. of Prizes 	<p>Increased performance in the West Region is due to Education Reform</p> <p>Greater autonomy in resource allocation to institutions results in its usage in more effective manner.</p>

Data Envelopment Analysis (DEA) Efficiency Measurement applied to Higher Institutions of Learning – (Continued).

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Efficiency Measurement applied to Higher Institutions of Learning – (Continued).

Author & Year	Country & Sample	Methods	Inputs	Outputs	Main conclusion
10. Necmi K. Avkiran (2001)	36 Australian Universities. Data: 1995	DEA Model 1 • FTE Academic Staff • FTE Non-academic Staff Model 2 • FTE Academic Staff • FTE Non-academic Staff Model 3 • FTE Academic Staff • FTE Non-academic Staff	Undergraduate Student Enrolments Postgraduate Student Enrollment Research Quantum Student retention rate Student Progress Rate Graduate Full time enrolment Overseas fee-paying enrollment Non-overseas fee-paying enrollment	Undergraduate Student Enrolments Postgraduate Student Enrollment Research Quantum Student retention rate Student Progress Rate Graduate Full time enrolment Overseas fee-paying enrollment Non-overseas fee-paying enrollment	Australian universities already operating at technical and scale efficiency. Great potential to raise number of fee-paying postgraduate enrolment. Small slacks in input utilisation.
11. Husain, N., Abdullah, M., & Agus, A.(2000)	50 IRPA Research projects of UKM, Malaysia	DEA • No. of Researchers. • Research Expenditure	Supervision of Masters and PhD students. Journals publications Proceedings papers Book/ collection of chapters, books, monographs Technical reports	Supervision of Masters and PhD students. Journals publications Proceedings papers Book/ collection of chapters, books, monographs Technical reports	Research criteria and indicators must be agreed upon by the academic upfront. Research Performance Management Systems need to be formed to deal with issues pertaining research conducted by universities
12. Calhoun, J. (2003)	1,323 IHIs in the USA Data: 1995/1996	DEA • Academic support expenditure Institutional support expenditure • Tuition & fee revenue • Federal, state and local appropriates	Public service expenditure Federal, state, private grant & contracts No. of bachelor degrees No. of masters degrees No. of doctoral degrees No. of first-professional degrees	Public service expenditure Federal, state, private grant & contracts No. of undergraduate No. of graduates Tuition & fee revenue Federal, state and local appropriates	IHIs with smaller percentage of unrestricted revenue are more efficient than IHIs with higher percentage of unrestricted revenue.
13. Abbott, M. & Doucouliagos, C. (2003)	36 Australian Universities Data: 1995	DEA • No. of FTE Academic Staff • No. of non-academic Staff • Capital Stock	Research Quantum	Efficiency of Australian universities seems high.	

Data Envelopment Analysis (DEA) Efficiency Measurement applied to Higher Institutions of Learning – (Continued).

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Author & Year	Country & Sample	Methods	Inputs	Outputs	Main conclusion
14. Casu, B. & Thanassoulis, E. (2003)	108 Universities in the UK (86-England, 7-Wales, 13-Scotland & 2-Northern Island) Data: 1999/2000	DEA	<ul style="list-style-type: none"> • Total Administrative Staff Cost • Other Operating Expenses 	<ul style="list-style-type: none"> • Total Income from Students • Total Staff Cost (minus total administrative staff cost) • Technology Transfer 	Although universities vary in size, there is no issue of scale efficiency. With exception of a few institutions, scale does not seem to have an adverse impact on the productivity of Central Administrative Services.
15. Flegg, A.T., Allen, D.O., Thurlow, I.W. (2004)	45 British Universities Data: 1980/81 to 1992/1993	DEA Malmquist Approach	<ul style="list-style-type: none"> • No. of Staff • No. of Undergraduate Students • No. of Postgraduate, Students • Aggregate Departmental Expenditure 	<ul style="list-style-type: none"> • Income from Research & Consultancy • Number of Undergraduate Degrees awarded • Number of Postgraduate Degrees awarded 	Total productivity rose by 51.5% between this period due to substantial outward shift in the efficiency frontier.