Benchmarking of university research

Professor James Angus
Dean, Faculty of Medicine, Dentistry and Health Sciences
The University of Melbourne

Why benchmark research?

- to facilitate improvement in research quality
- to support government aspirations to become knowledge-based economies (e.g., European Commission, Australian Government)
- to underpin national allocations of performance-based funding
- for marketing purposes in competition for students

When we benchmark…

'We compare ourselves with others, thereby identifying strengths and weaknesses and learning how to improve.

We also find a way forward to adopting best practice'.

Association of Commonwealth Universities

International

- e.g.,

  Institute of Higher Education, Jiao Tong University, Shanghai: ranking of top 500 universities on the basis of research-based measures

National

e.g.,

- UK Research Assessment Exercise
- Australia: DEST institutional assessment framework
- Australia: Go8 annual benchmarking program

A major current issue for Australia:

Australian performance-based funding formula is currently based mainly on research inputs

2003 ranking by Shanghai Jiao Tong University Institute of Higher Education

- **Ranking criteria**
  - 1. Nobel laureates (weighted total 1911–2002)
  - 2. Number of highly cited researchers in 21 broad subject categories 1981–99
  - 3. Journal articles published in *Nature* or *Science* 2000-02, weighted for order of author affiliation
  - 4. Total articles in SCI-expanded and SSCI
  - 5. Academic performance per faculty EFT (scores from 1-4 above per faculty EFT)

Shanghai assessment: calculation and weights

- For each indicator, highest-scoring institution scores 100 and others are calculated as a percentage of that score
- Each parameter 1-5 is then equally weighted to provide final rank

Shanghai assessment: relative scores

University (rank)	Country	Overall score	Nobel Prizes	Highly Cited	*Nature & Science*	Science Citation Index	Score per faculty EFT
Harvard (1)	**USA**	**100**	**100**	**100**	**100**	**100**	**68.7**
Oxford (9)	**UK**	**59.5**	**53.3**	**45.9**	**57.2**	**66.2**	**55.6**
Top U21 institution per category							
UBC	**Canada**	**38.2**					
Freiburg	**Germany**		**23.6**				
Virginia	**USA**			**38.4**			
Edinburgh	**Scotland**				**37.9**		
UBC	**Canada**					**59.1**	
UBC	**Canada**						**35.8**
U21 range		**26.5-38.2**	**0-23.6**	**0-38.4**	**6.7-37.9**	**35.3-59.1**	**5.9-35.8**

Shanghai assessment: Universitas 21

- Six U21 universities in top 100: UBC, Edinburgh, Virginia, McGill, Melbourne, Lund
- U21 top-50 rank: UBC (35) and Edinburgh (43).
- All U21 universities in top 350

- Note: some controversy over the selection of the ranking criteria; however other studies have shown similar trends: i.e., dominance of US universities (Shanghai assessment: US has 35 of top 50, UK 15 of top 50).

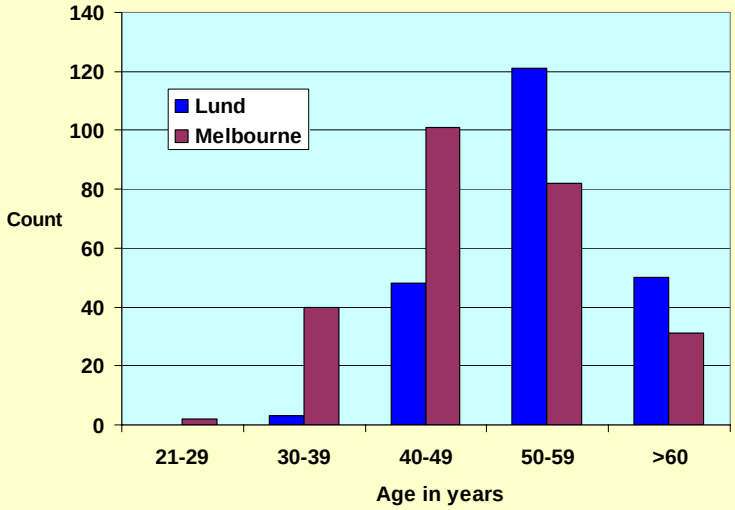
A potential case study

University (Shanghai rank)	Overall score	Nobel Prizes 1911-2002	Highly cited 1981-1999	*Nature & Science* 2000-02	SCI	*Score per faculty EFT
Melbourne (92)	**26.8**	15.9	14.5	17.0	52.9	25.1
Lund (93)	**26.5**	0	22.9	20.9	55.3	24.8

Note: authors state that EFT data available only for USA and China, hence these data questionable

Age demographic for medical faculty tenured staff, 2003

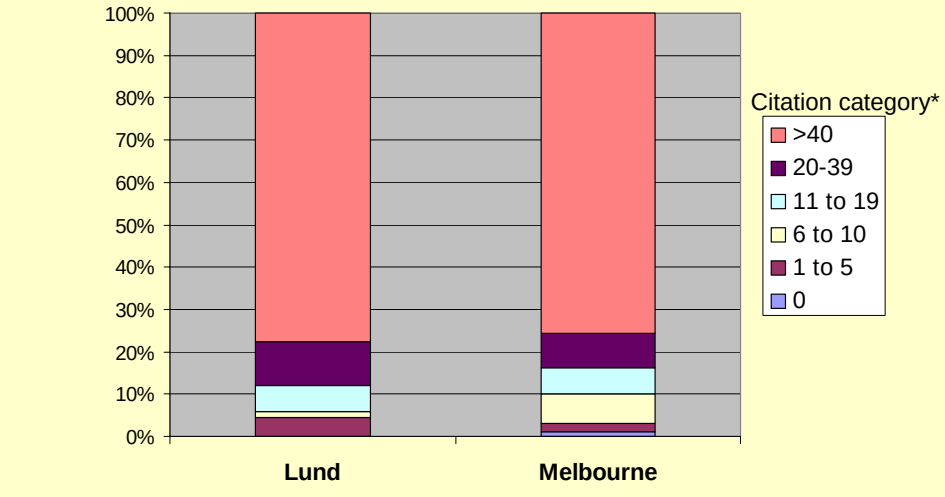
n=202 Lund; n=256 Melbourne



Melbourne and Lund: articles in eight top journals 1992-98

- Cell
- EMBO Journal
- Journal of Clinical Investigation
- Lancet
- Nature
- New England Journal of Medicine
- Proc. Nat. Acad. of Sciences of the USA
- Science

Distribution of biomedical papers from top eight journals by citation category for 1992-98



Number of papers in eight top journals → Lund: 65; Melbourne: 98

* at September 2004

Melbourne and Lund

- Lund has a greater percentage (89% vs 83%) of top-eight journal articles published 1992-98 with more than 20 cites
- But Melbourne has 50% more articles in top eight journals with only 25% more tenured academic staff
- further analysis (including contribution of contract and non-tenured staff, discipline variation) may determine the cause of these apparent productivity and prestige differentials and lead to strategies for improvement in quality of research

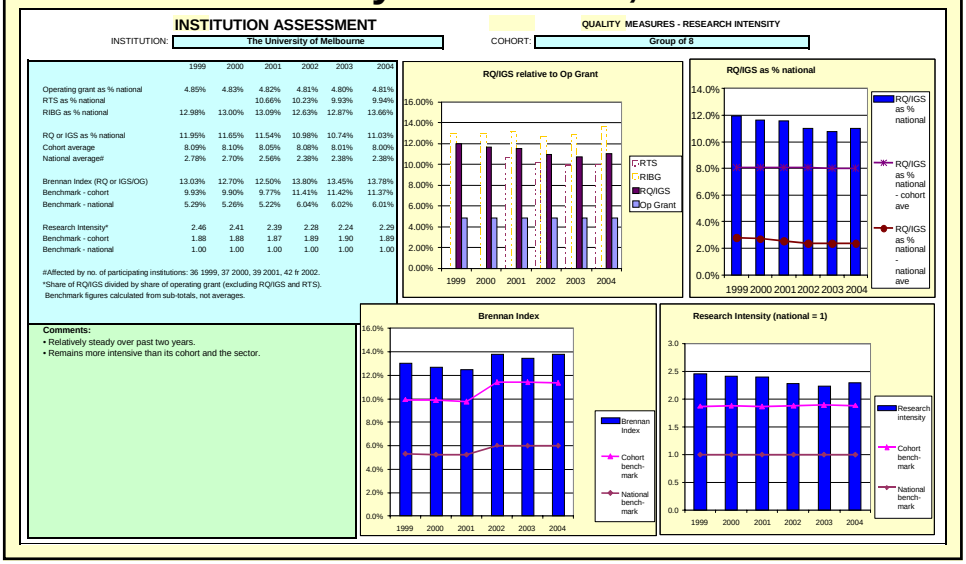
National benchmarking: 1. UK RAE

- Overall has had positive effects on the quality and funding of science in the UK, but at large personal and financial cost
- Next RAE 2008 will be under a set of parameters modified from those used previously
- Past RAEs subject to manipulation by departments and institutions

The next RAE

- will cover six years of outputs up to 31 October 2007
- will examine up to four outputs per researcher
- will give equal weight to research excellence in all forms and contexts
- detailed criteria for the 2008 assessment yet to be released

2. National benchmarking in Australia: institutional assessment of research intensity from DEST, 2004



INSTITUTION ASSESSMENT — **QUALITY MEASURES - RESEARCH INTENSITY**

INSTITUTION: The University of Melbourne — COHORT: Group of 8

	1999	2000	2001	2002	2003	2004
Operating grant as % national	4.85%	4.83%	4.82%	4.81%	4.80%	4.81%
RTS as % national			10.66%	10.23%	9.93%	9.94%
RIBG as % national	12.98%	13.00%	13.09%	12.63%	12.87%	13.66%
RQ or IGS as % national	11.95%	11.65%	11.54%	10.98%	10.74%	11.03%
Cohort average	8.09%	8.10%	8.05%	8.08%	8.01%	8.00%
National average#	2.78%	2.70%	2.56%	2.38%	2.38%	2.38%
Brennan Index (RQ or IGS/OG)	13.03%	12.70%	12.50%	13.80%	13.45%	13.78%
Benchmark - cohort	9.93%	9.90%	9.77%	11.41%	11.42%	11.37%
Benchmark - national	5.29%	5.26%	5.22%	6.04%	6.02%	6.01%
Research Intensity*	2.46	2.41	2.39	2.28	2.24	2.29
Benchmark - cohort	1.88	1.88	1.87	1.89	1.90	1.89
Benchmark - national	1.00	1.00	1.00	1.00	1.00	1.00

#Affected by no. of participating institutions: 36 1999, 37 2000, 39 2001, 42 fr 2002.
*Share of RQ/IGS divided by share of operating grant (excluding RQ/IGS and RTS).
Benchmark figures calculated from sub-totals, not averages.

Comments:
- Relatively steady over past two years.
- Remains more intensive than its cohort and the sector.

Quality measures: research productivity

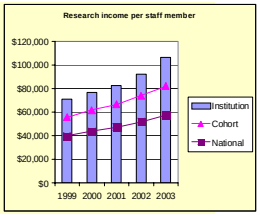
INSTITUTION ASSESSMENT FRAMEWORK — **QUALITY MEASURES - RESEARCH PRODUCTIVITY**

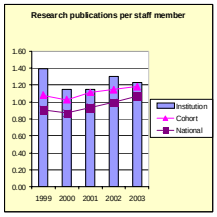
INSTITUTION: **The University of Melbourne** COHORT: **Group of 8**

RESEARCH INCOME AND PUBLICATIONS PER STAFF MEMBER

	1999	2000	2001	2002	2003
Research income $m	$143.2	$155.3	$174.1	$202.9	$246.1
Research publications	2,791	2,331	2,417	2,856	2,858
Staff	2,011	2,023	2,109	2,199	2,315
Research income per staff member	$71,213	$76,759	$82,571	$92,288	$106,325
Research income per staff member - cohort	$55,756	$62,009	$66,787	$74,245	$82,082
Research income per staff member - national	$39,948	$43,833	$47,375	$51,978	$57,542
Research publications per staff member	1.39	1.15	1.15	1.30	1.23
Research publications per staff member - cohort	1.08	1.03	1.11	1.15	1.18
Research publications per staff member - national	0.91	0.87	0.93	0.99	1.07

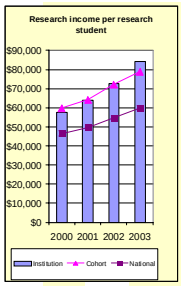
Research income = HERDC categories 1,2,3,4 + RQ/GS + RIBG
Research publications are weighted total (unaudited data)
Staff are FTE Research only and Teaching and Research (casual staff not included)
Note that some publications counted are produced by students. It is not possible to disaggregate these from staff publications.

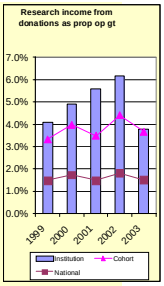




RESEARCH INCOME PER RESEARCH STUDENT

	2000	2001	2002	2003
Research income $m	$155.283	$174.141	$202.942	246.143
Research students	2,703	2,728	2,785	2,925
Research income per student	$57,448	$63,835	$72,870	$84,163
Research income per student - cohort	$59,836	$64,203	$72,193	$79,033
Research income per student - national	$46,558	$49,659	$54,752	$59,900





RESEARCH INCOME FROM DONATIONS AND BEQUESTS

	1999	2000	2001	2002	2003
Donation and bequest income $m	$8.28	$10.05	$11.74	$13.32	$8.36
Institution's D & B income relative to operating grant	4.08%	4.91%	5.58%	6.17%	3.77%
Cohort's D & B income relative to operating grant	3.33%	3.97%	3.49%	4.40%	3.66%
Sector's D & B income relative to operating grant	1.49%	1.74%	1.49%	1.82%	1.52%

Analysis of income from donations and bequests:
- Over 1999-2003 income levels have averaged 5% of operating grant.
- In 2003 income has fallen, as percentage of its operating grant, to below 1999 levels
- D&B research income significantly higher than sector average.

Analysis

Res inc per staff member
- In dollar terms has risen by approx 50% over 1999-2003.
- Institution continues to outperform cohort and sector average.

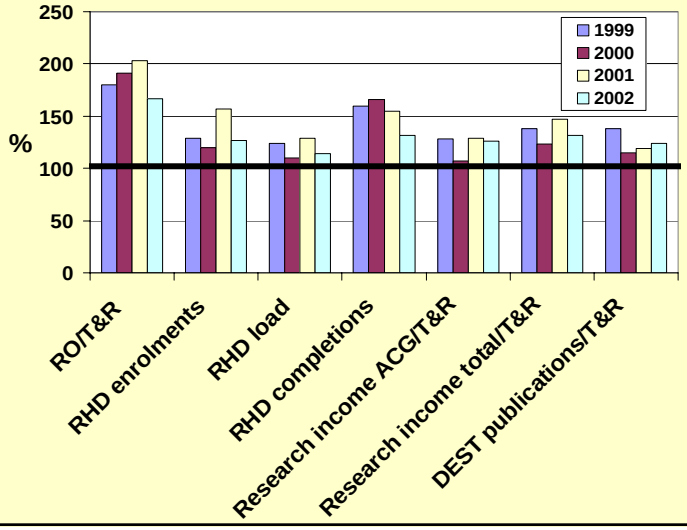
Res pubs per staff member
- Output has fluctuated, with 2003 output equivalent to 1999-2002 average.
- Over past 3yrs roughly equivalent to cohort average.

Res inc per res student
- Performance is consistent with cohort average but higher than sector.
- Income per student was $84,163 in 2003, representing a 47% increase over 1999-2003.

3. National benchmarking in Australia: Go8

- Uses data collected annually for the Department of Education Science and Training (DEST) from which performance based funding has been allocated to Australia's 38 universities since 1999
- Provides analysis down to departmental level across the nation's eight research intensive universities….

e.g., Faculty of Medicine, Dentistry & Health Sciences, University of Melbourne: benchmarking against the Go7



Pre-empting the Australian Government's agenda for change to performance-based research evaluation

Backing Australia's Ability II

- CRC program continues
- ARC NCG program maintained
- infrastructure to research institutes ($200M)
- biotech innovation expanded
- CSIRO national flagship funds ($305M)
- **review performance-based funding ($2.8M)**

The start:
Measuring excellence in research and research training

Shine Dome, Canberra, June 22nd, 2004

http://www.science.org.au/proceedings/researchexcellence/index.htm

Starting to define the framework for Australia in 2006:

Canberra June 4, 2004

- **working-group questions:**

For both research and research training

- What must the framework achieve?
- what must it avoid?

Australian performance-based research evaluation

Q: Will a new system measure quality or excellence or both?

A:

- it should be fair, equitable and recognize diversity
- it must have confidence of the public and stakeholders
- it must be established with reference to social and economic objectives

Research assessment proposal

Canberra June 2004

- research: output measures to be emphasized
- may include peer review of reputation and creativity
- research training performance: cluster-based, reflecting quality of student experience/publications/skills

Starting to define the framework for Australia in 2006:

Canberra June 4, 2004

- **working-group questions:**

For both research and research training

- What must the framework achieve?
- what must it avoid?

Starting to define the framework for Australia in 2006:

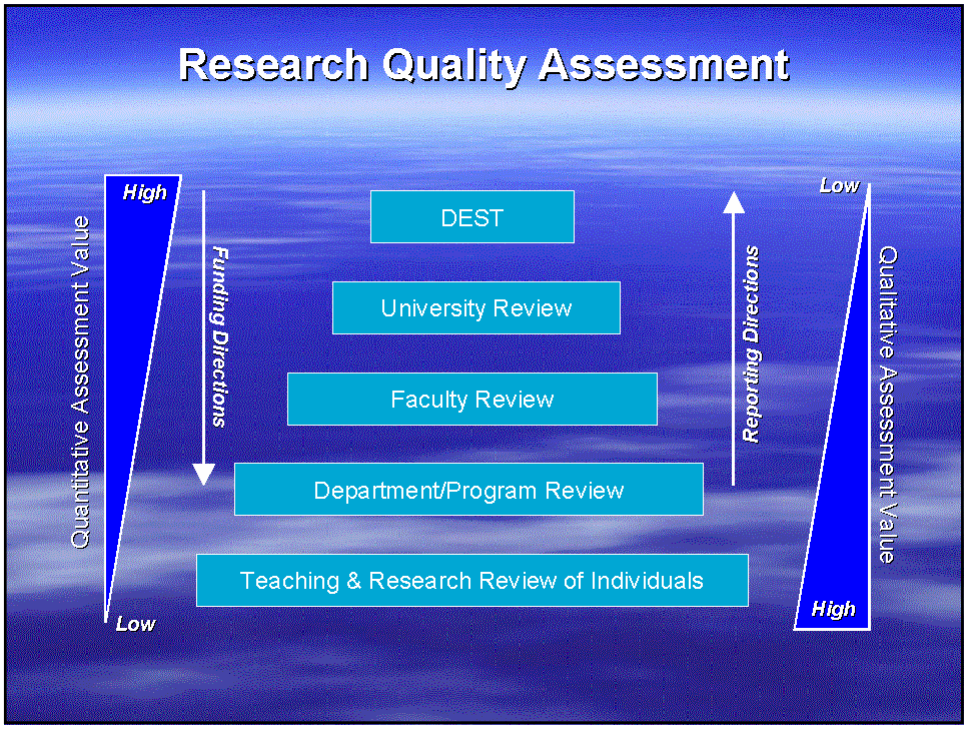
Canberra June 4, 2004

- **Research assessment must achieve**
- **trust of the stakeholders i.e.,**
  - be discipline-specific
  - take into account non-traditional contributions of intellectual merit
  - allow for commercial-in-confidence activities
  - allow for variations in opportunity to conduct research

Starting to define the framework for Australia in 2006:

Canberra June 4, 2004

- **Research assessment must avoid**
  - assessments that are expensive and time-consuming
  - measures that are simplistic
  - excessive focus on inputs
  - rewarding short-term thinking
  - policies that inhibit innovation, independent and original thought
  - results that can be manipulated
  - the treatment of all disciplines in the same way
  - encouraging only 'safe' research
  - multiple counts of the same indicator



Starting to define the framework for Australia in 2006:

Canberra June 4, 2004

Research training assessment must achieve

- **For employers:**
- **highest quality graduates who are**
  - **industry-ready**
  - **able to work in teams**
- **For graduates**
- **employability (alignment with national priorities, generic skills)**
- **capacity for career progression**
- **having high standards of integrity**

Canberra June 22nd

Starting to define the framework for Australia in 2006:

Research training assessment proposal

- Three research training clusters
- C1: science, engineering and technology
- C2: health and medical research
- C3: arts, humanities and social sciences

Starting to define the framework for Australia in 2006:

Canberra June 4, 2004

Research training assessment must avoid

- use of a very limited range of assessments
- artificially shortening PhD programs just to improve completion rates
- producing graduates unfit to enter academic teaching or mainstream industry and business

Canberra June 22nd

Starting to define the framework for Australia in 2006:

- Research training performance index
  - perhaps a two-factor formula based on
    - research higher degree completions (50%) and
    - a cluster-based index (50%), incorporating
      - research-activity of staff
      - quality of publications of the cluster
      - quality of supervision and supervisor training
      - skills courses undertaken by students
      - teaching experience
- Note C1 and C2 to have research income as a factor also