Challenges in Ranking of Universities

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One Basic Question:
How can we identify the best universities in the world?
6 Research Questions:

1. Research or Teaching?
2. How to Measure Performance?
3. For all universities in the world?
4. One numerical value?
5. Significance of positions?
6. How many?
Two most influential international rankings:

Shanghai Jiao Tong University  (60% bibliom.)
Times Higher Education Supplement  (20% bibliom.)
Important national rankings:

Germany:

CHE
DFG
We can ask experts for their judgment......
...or let scientific output and its impact speak: bibliometric analysis
Books
Reports
Book chapters
Conf. Proceed.
Books
Journal articles
within CI

…. and also field-specific!
<table>
<thead>
<tr>
<th>Country</th>
<th>P 2001-2004</th>
<th>C 2001-2004</th>
<th>CPP/FCSm</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>994,650</td>
<td>3,747,932</td>
<td>1.38</td>
</tr>
<tr>
<td>JAPAN</td>
<td>278,420</td>
<td>605,876</td>
<td>0.86</td>
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<tr>
<td>GREAT BRITAIN</td>
<td>270,517</td>
<td>851,704</td>
<td>1.22</td>
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<tr>
<td>GERMANY</td>
<td>251,365</td>
<td>743,582</td>
<td>1.12</td>
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<tr>
<td>FRANCE</td>
<td>180,145</td>
<td>490,137</td>
<td>1.05</td>
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<tr>
<td>PEOPLES R CHINA</td>
<td>162,771</td>
<td>174,316</td>
<td>0.57</td>
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<td>ITALY</td>
<td>132,091</td>
<td>320,773</td>
<td>0.95</td>
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<tr>
<td>CANADA</td>
<td>131,469</td>
<td>382,198</td>
<td>1.18</td>
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<tr>
<td>SPAIN</td>
<td>94,005</td>
<td>197,001</td>
<td>0.91</td>
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<tr>
<td>RUSSIA</td>
<td>91,749</td>
<td>83,335</td>
<td>0.43</td>
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<tr>
<td>AUSTRALIA</td>
<td>83,675</td>
<td>213,928</td>
<td>1.07</td>
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<td>NETHERLANDS</td>
<td>75,903</td>
<td>251,170</td>
<td>1.27</td>
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<tr>
<td>SOUTH KOREA</td>
<td>70,878</td>
<td>101,548</td>
<td>0.78</td>
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<tr>
<td>INDIA</td>
<td>68,685</td>
<td>70,965</td>
<td>0.46</td>
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<tr>
<td>SWEDEN</td>
<td>59,144</td>
<td>187,035</td>
<td>1.15</td>
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<tr>
<td>SWITZERLAND</td>
<td>54,484</td>
<td>215,893</td>
<td>1.39</td>
</tr>
<tr>
<td>BRAZIL</td>
<td>46,005</td>
<td>59,758</td>
<td>0.6</td>
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<tr>
<td>TAIWAN</td>
<td>45,948</td>
<td>60,273</td>
<td>0.72</td>
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<tr>
<td>POLAND</td>
<td>42,490</td>
<td>54,078</td>
<td>0.6</td>
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<tr>
<td>BELGIUM</td>
<td>40,916</td>
<td>116,947</td>
<td>1.15</td>
</tr>
</tbody>
</table>

| Total                   | 3,681,790   | 9,850,029   |          |
Expert Survey Problems: (methodological)

1. Biases: geographical, field-specific
2. Responding > Non-responding characteristics
3. Sample size > reliability of measurement
4. Nomination procedure
5. Scaling procedure
6. Controlling variables
7. Standard deviation scores
8. Statistical significance
Correlation between Expert Scores with Citation-Analysis Based Scores
THE Ranking 2004

\[ y = 53.985x^{0.0397} \]

\[ R^2 = 0.005 \]
...so we have some problems here.....
Bibliometric Analysis Problems:

1. Technical
2. Methodological
1. Technical problems:

- citing-cited mismatches
- definition & unification of institutions

*(specific responsibility)*
2. Methodological Problems:

- Field definition
- Field-normalization of citation counts
- Black box indicators
- Highly cited scientists > highly cited article
- Article-type normalization of citation counts
- US bias
- Language bias (Germany: 25%!)
- Engineering, Social Sciences, Humanities
- Same data, same methodology, different rankings
New Approaches:

- Iteration of Expert Survey focused on top
- Output-specific analysis engineering fields, social science and humanities
- Top-10% bibliometric analysis
Top-10% Approach:

1. Identify universities with \( P > 200/y \) \((N \sim 250)\)
2. Collect all publication so these universities
3. Ranking by:
   - entire oeuvre
   - top-10% of the oeuvre
     in both cases: \( CPP \) and \( CPP/FCSm \)
   - \( CPP/FCSm(top) \times P(top) \)
Outlook:

- Improved ranking procedures will further *de-equalize* universities and reinforce a *scientific elite league*
- Excessive evaluation hypes will lead to *science destruction*
- Balance has to be found by *data-system improvement* and *automation of advanced bibliometric assessment procedures*
Characteristics of a successful university in a bibliometric approach
ASTRON & ASTROPH (1.38)
BIOCH & MOL BIOL (0.96)
ONCOLOGY (1.05)
IMMUNOLOGY (1.22)
HEMATOLOGY (1.27)
GENETICS & HERED (1.48)
PHARMACOL & PHAR (1.11)
PHYSICS,MULTIDIS (1.84)
PHYSICS, COND MA (1.21)
ENDOCRIN & METAB (0.99)
MEDICINE,GENERAL (3.35)
RAD,NUCL MED IM (1.04)
CHEM, PHYSICAL (1.00)
CARD & CARD SYST (0.95)
RHEUMATOLOGY (1.75)
CLIN NEUROLOGY (1.72)
NEUROSCIENCES (0.86)
CHEM, INORG&NUC (1.82)
PHYSICS, AT,M,C (0.87)
PERIPH VASC DIS (1.00)
CELL BIOLOGY (0.90)
MULTIDISCIPL SC (1.31)
CHEM, ORGANIC (1.02)
PLANT SCIENCES (1.04)
PATHOLOGY (1.56)
SURGERY (1.34)
CHEMISTRY (1.60)
COMPU SCI,THEORY (1.05)
PEDIATRICS (1.56)

>50% above, and no field below internat. average
Field normalized impact scores for scientific cooperation types
Growing (inter)national scientific cooperation

- 1980 - 1983
- 1981 - 1984
- 1982 - 1985
- 1983 - 1986
- 1984 - 1987
- 1985 - 1988
- 1986 - 1989
- 1987 - 1990
- 1989 - 1992
- 1990 - 1993
- 1992 - 1995
- 1993 - 1996
- 1994 - 1997
- 1995 - 1998
- 1996 - 1999
- 1997 - 2000
- 1998 - 2001
- 1999 - 2002
- 2000 - 2003
- 2001 - 2004

Legend:
- Single address
- National
- International
Thank you for your attention

and thanks to the Institute of Higher Education, Shanghai Jiao Tong University for organizing a first conference on this very hot topic of ranking