Assessment of university rankings in the frame of measuring university performance
Background

Origin

2003: Shanghai Jiao Tong University Ranking

Comparison of research performance according to objective indicators in order to identify the ‘gap’ between Chinese and US world-class research universities
Trend: growth in number of ranking users

Users
- Policymakers
- Governments and financers
- Researchers
- Students and parents
- Alumni and industrial partners

Goals
- Informing students and parents on study options
- Stimulating indicators for measuring quality
  - National
  - International
- Stimulating policy analysis in higher education institutions
General ranking critiques

- Focus on top universities, mostly research-oriented
- Little & poor indicators for education and valorisation
- Focus on quantity vs quality
- (Poor definition of) methodology and semantics
- Disadvantages for:
  - Small universities
  - Arts, humanities and social sciences
  - Non-English publications
Trend: growth in number of rankings
Ranking overview
# Ranking overview

<table>
<thead>
<tr>
<th>National</th>
<th>World-wide</th>
</tr>
</thead>
<tbody>
<tr>
<td>League</td>
<td>League</td>
</tr>
<tr>
<td>Multidimensional</td>
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</table>

<table>
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<th>Research only</th>
<th>Multi-factorial</th>
<th>Research only</th>
<th>Multi-factorial</th>
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<tbody>
<tr>
<td>Perspektywy</td>
<td>CHE</td>
<td>ARWU</td>
<td>THE</td>
<td>QS</td>
<td>CWTS</td>
<td>U-Multirank</td>
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</table>
## Shangai/ARWU indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Quality of education</td>
<td></td>
</tr>
<tr>
<td>Alumni winning Nobel Prizes and Fields Medals</td>
<td>10%</td>
</tr>
<tr>
<td>Quality of faculty</td>
<td></td>
</tr>
<tr>
<td>Staff winning Nobel Prizes and Field Medals</td>
<td>20%</td>
</tr>
<tr>
<td>ISI-Highly Cited Researchers</td>
<td>20%</td>
</tr>
<tr>
<td>Research Output</td>
<td></td>
</tr>
<tr>
<td>Papers in Nature and Science</td>
<td>20%</td>
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<tr>
<td>Papers in SCI and SSCI</td>
<td>20%</td>
</tr>
<tr>
<td>Per Capita Performance</td>
<td></td>
</tr>
<tr>
<td>Per capita academic performance</td>
<td>10%</td>
</tr>
</tbody>
</table>

Rankings

Quacquarelli Symonds (=QS) Indicators

- Academic reputation: 40%
- Employer reputation: 10%
- Student-to-faculty ratio: 20%
- Citations per faculty (scaled): 20%
- International faculty ratio: 5%
- International student ratio: 5%

Rankings

THE indicators

- **Teaching - the learning environment: 30%**
  - Reputation Survey (15%)
  - PhD awarded-to-academic staff ratio (6%)
  - Staff-to-student ratio (4.5%)
  - PhD awards/BSc awards (2.25%)
  - Income per academic (2.25%)

- **Research: 30%**
  - Reputation survey (18%)
  - Volume (scaled) (6%)
  - Income (scaled) (6%)

- Citation impact (normalized average citations per paper): 30%
- Research income from industry (scaled): 2.5%
- International outlook: staff, students and research: 7.5%

Rankings

CWTS Leiden

- WoS publications 2011-2014
  - Article and reviews on WoS Core Collection
  - Fractional counting

- Impact indicators
  - $P(\text{top1})$, $PP(\text{top1})$
  - $P(\text{top10})$, $PP(\text{top10})$
  - $P(\text{top50})$, $PP(\text{top50})$
  - TCS and MCS (total/mean number of citations)
  - TNCS and MNCS (total/mean number of cit., normalized for field + year)

- Collaboration indicators
  - $P(\text{collab})$, $PP(\text{collab})$
  - $P(\text{int collab})$, $PP(\text{int collab})$
  - $P(<100km)$, $PP(<100km)$
  - $P(>5000km)$, $PP(>5000km)$

http://www.leidenranking.com/ranking/2016/list
U-Multirank

- Multidimensional, user-driven, shows diversity of institutions, performance groups (very good – weak)

- Indicators:
  - Teaching and learning
  - Research
  - Knowledge transfer
  - International orientation
  - Regional engagement

http://www.umultirank.org
<table>
<thead>
<tr>
<th>Dimension</th>
<th>General</th>
<th></th>
<th>RESEARCH</th>
<th>KNOWLEDGE TRANSFER</th>
<th>INTERNATIONAL ORIENTATION</th>
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<tr>
<td></td>
<td></td>
<td>General</td>
<td>Institutional ranking</td>
<td>Field-based rankings</td>
<td></td>
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<tr>
<td>TEACHING &amp; LEARNING</td>
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<tr>
<td>• Student-staff ratio</td>
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<td>• Bachelor graduation rate</td>
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<td>• Master graduation rate</td>
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<tr>
<td>• Academic staff with doctorates</td>
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<td>• Graduating on time (bachelors)</td>
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<tr>
<td>• Graduating on time (masters)</td>
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<tr>
<td>• Contact with work environment (bachelors)</td>
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<tr>
<td>• Contact with work environment (masters)</td>
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<td>• Indicators from student survey:</td>
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<td>• Overall learning experience</td>
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<td>• Quality of courses &amp; teaching</td>
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<td>• Organisation of program</td>
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<tr>
<td>• Inclusion of work/practical experience</td>
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<td>• Contact with teachers</td>
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<td>• Facilities:</td>
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<td>• Library facilities</td>
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<td>• Laboratory facilities</td>
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<td>• Room facilities</td>
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<td>• IT provision</td>
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<td>REGIONAL ENGAGEMENT</td>
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<td>• Bachelor graduates working in the region</td>
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<tr>
<td>• Master graduates working in the region</td>
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<td>• Student internships in the region</td>
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<td>X</td>
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<tr>
<td>• Regional joint publications*</td>
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<td>X</td>
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<tr>
<td>• Income from regional sources</td>
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</table>
U-Multirank

- Data collection and verification
  - Self-reported data
  - Student survey
  - Databases:
    - Web of Science
    - PATSTAT

- Passive/active participation
Question: how can universities be compared?

Compare research activities of St Andrews university with universities in EU

- U-Multirank: [http://www.umultirank.org](http://www.umultirank.org)
- Compare
- Compare like with like
- Compare universities as a whole
- Level of study: doctorate
- Filter by country:
  - Click “select European Union”
  - 530 universities are selected
Question: how can universities be compared?

Compare research activities of St Andrews university with universities in EU

- Select the following indicators:
  - Research:
    - Citation rate
    - Research publications (absolute numbers)
    - Research publications (size normalised)
    - Top cited publications
    - Interdisciplinary publication
  - Knowledge Transfer
    - Co-publications with industrial partners
    - Publications cited in patents
  - International orientation
    - International joint publications
  - Regional Engagement
    - Regional joint publications
Question: how can universities be compared?

Compare research activities of St Andrews university with universities in EU
- Click “show scores”
- Sort data on top scores (click arrow down)

Questions:
- Where is St Andrews University ranked?
- What are the strengths and weaknesses of St Andrews University?
Question: how can universities be compared?

Compare research activities of St Andrews university with universities in EU

- Select “Size of Institution”: Small
- Select “Age of Institution”: pre 1870

→ 30 universities have a similar profile as St Andrews university

- Questions:
  - Where is St Andrews University ranked now?
  - What does this comparison learn us?
Ranking assessment
Assessment of indicators

Choice of indicators

- Complex processes, but simple indicators
- Proxies or representative?
  - e.g. ARWU: education = alumni with a Nobel prize
- Size dependent: absolute or relative indicators?
  - e.g. staff: FTE or headcounts?
- Quantity versus efficiency

Question: Quality of education?

- Shanghai ranking
  - Alumni of institution winning Nobel Prizes and Fields Medals
- THE ranking, composite score of:
  - Reputation
  - Staff-to-student ratio
  - Doctorate-to-bachelor’s ratio
  - Doctorates awarded-to-academic staff ratio
  - Institutional income
- QS rankings
  - Employer reputation?
  - Student-to-faculty ratio?
Question: Quality of education in rankings

<table>
<thead>
<tr>
<th></th>
<th>THE</th>
<th>ARWU</th>
<th>QS reputation</th>
<th>QS student-staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>California Institute of Technology</td>
<td>1</td>
<td>9</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Stanford University</td>
<td>2</td>
<td>14</td>
<td>1</td>
<td>32</td>
</tr>
<tr>
<td>Massachusetts Institute of Technology (MIT)</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
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<tr>
<td>University of Cambridge</td>
<td>4</td>
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<td>1</td>
<td>1</td>
</tr>
<tr>
<td>University of Oxford</td>
<td>5</td>
<td>8</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Yale University</td>
<td>6</td>
<td>11</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Columbia University</td>
<td>7</td>
<td>5</td>
<td>27</td>
<td>1</td>
</tr>
<tr>
<td>University of Chicago</td>
<td>8</td>
<td>6</td>
<td>48</td>
<td>60</td>
</tr>
<tr>
<td>Princeton University</td>
<td>9</td>
<td>7</td>
<td>30</td>
<td>65</td>
</tr>
<tr>
<td>Harvard University</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>40</td>
</tr>
</tbody>
</table>
Assessment of indicators

Semantic description of indicators

- Lack of/poor semantic description of indicators
  - e.g. PhD student = student or researcher?
- Context-specific interpretation resulting in differences in data collection

Assessment of data collection

Public databases (e.g. WoS, Scopus)

- International, scientific articles
- Other article types? Books? Non-English publications?
- Field-specific (dis)advantages

Universities

- In-depth data but often not objective
- Lack of proper control mechanisms on data
- Time-consuming
Assessment of data collection

Surveys

- Up to 50% of total ranking score (e.g. QS)
- Response-rate often very low
- Reputation representative for:
  - Performance analysis
  - Quality
Assessment of methodology

**Transparency**
- Is methodology adequately described?

**Objectivity**
- Often predefined choice of weights

**Poor description of methodology**
- e.g. publications: whole or fractional counting?
Assessment of methodology

Calculation of total ranking score

- e.g. THE ranking

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching</td>
<td>30%</td>
</tr>
<tr>
<td>Research</td>
<td>30%</td>
</tr>
<tr>
<td>Citations</td>
<td>30%</td>
</tr>
<tr>
<td>Industry income</td>
<td>2.5%</td>
</tr>
<tr>
<td>International outlook</td>
<td>7.5%</td>
</tr>
<tr>
<td>TOTAL SCORE</td>
<td>100%</td>
</tr>
</tbody>
</table>

\[ 50 \text{ Euro} + 50 \text{ GBP} \neq 100 \text{ Euro} \]

\[ 50 \text{ Euro} + 50 \text{ GBP} = 119.5 \text{ Euro} \quad \text{* 50 GBP = 69.5 Euro} \]

Interpretation of ranking results

- Frequent error: only focus on ranking position
  - Total ranking score = sum of proxies
  - Ranking score ≠ ranking position

Example:

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th></th>
<th>2016</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Rank</td>
<td>Score (%)</td>
<td>Rank</td>
</tr>
<tr>
<td>UNIV X</td>
<td>55</td>
<td>63.7</td>
<td>35</td>
</tr>
<tr>
<td>UNIV Y</td>
<td>90</td>
<td>56.2</td>
<td>118</td>
</tr>
</tbody>
</table>
Question: Conclusion/Advice to UHasselt?
### Pitfalls in calculation of overall ranking result

#### Academic Ranking of World Universities 2015

<table>
<thead>
<tr>
<th>World Rank</th>
<th>Institution*</th>
<th>Country/Region</th>
<th>National Rank</th>
<th>Total Score</th>
<th>Score on Alumni</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Harvard University</td>
<td>🇺🇸</td>
<td>1</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>2</td>
<td>Stanford University</td>
<td>🇺🇸</td>
<td>2</td>
<td>73.3</td>
<td>40.7</td>
</tr>
<tr>
<td>3</td>
<td>Massachusetts Institute of Technology (MIT)</td>
<td>🇺🇸</td>
<td>3</td>
<td>70.4</td>
<td>68.2</td>
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<td>4</td>
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<td>🇺🇸</td>
<td>4</td>
<td>69.6</td>
<td>65.1</td>
</tr>
<tr>
<td>5</td>
<td>University of Cambridge</td>
<td>🇬🇧</td>
<td>1</td>
<td>68.8</td>
<td>77.1</td>
</tr>
<tr>
<td>6</td>
<td>Princeton University</td>
<td>🇺🇸</td>
<td>5</td>
<td>61.0</td>
<td>53.3</td>
</tr>
<tr>
<td>7</td>
<td>California Institute of Technology</td>
<td>🇺🇸</td>
<td>6</td>
<td>59.6</td>
<td>49.5</td>
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<tr>
<td>8</td>
<td>Columbia University</td>
<td>🇺🇸</td>
<td>7</td>
<td>58.8</td>
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<td>9</td>
<td>University of Chicago</td>
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<td>8</td>
<td>57.1</td>
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<td>10</td>
<td>University of Oxford</td>
<td>🇬🇧</td>
<td>2</td>
<td>56.6</td>
<td>49.7</td>
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<tr>
<td>11</td>
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<td>🇺🇸</td>
<td>9</td>
<td>54.5</td>
<td>47.6</td>
</tr>
</tbody>
</table>
Pitfalls in calculation of overall ranking result

**Interpretation of ranking results**

- Ranking score ≠ ranking position
- Differences in ranking position starting from 50 are meaningless due to small differences in ranking score

Question: Which university scores better?

<table>
<thead>
<tr>
<th>Category</th>
<th>Teaching</th>
<th>International Outlook</th>
<th>Research</th>
<th>Citations</th>
<th>Industry Income</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching score</td>
<td>30%</td>
<td>7,5%</td>
<td>30%</td>
<td>30%</td>
<td>2,5%</td>
<td>30%</td>
</tr>
<tr>
<td>International Outlook</td>
<td>119</td>
<td>172</td>
<td>30%</td>
<td>30%</td>
<td>7,5%</td>
<td>30%</td>
</tr>
<tr>
<td>Research</td>
<td>30%</td>
<td>7,5%</td>
<td>56,2</td>
<td>51</td>
<td>30%</td>
<td>30%</td>
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<tr>
<td>Citations</td>
<td>30%</td>
<td>7,5%</td>
<td>30%</td>
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<td>30%</td>
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<td>Industry Income</td>
<td>30%</td>
<td>7,5%</td>
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<td>Overall</td>
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<td>7,5%</td>
<td>30%</td>
<td>30%</td>
<td>2,5%</td>
<td>30%</td>
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</table>
Overview of pitfalls

- Indicators
- Data Collection
- Methodology
- Calculation of overall ranking result
Ranking impact

- Mind switch:
  - Quality: education at a highly-ranked university

- Funding policy
  - ex. India: bilateral cooperations
  - ex. Brazil: exchange students

- Government policy
  - ex. Immigration policy of The Netherlands and Denmark
Risks of rankings on policy formation

- Improvements only on indicator scores instead of on general quality
  - Ex. Policies to ‘buy’ more publications

- Management based on ranking position
  - Institutional/governmental: ex. financial stimuli

- Collaboration and networking based on ranking position
  - More focus on excellence
  - Differentiation disappears
Guidelines: how to interpret ranking results

**Interpretation of ranking results**

- What are the objectives of the ranking?
- What is the target audience?
- Which indicators are used?
  - Do indicators take into account the context, mission, disciplines of a university?
  - To what extent are the indicators representative?
  - To what extent are the indicators objective?
- Are the indicators and the used methodology semantically described in full detail?
- How is the data collected and calculated?
Interesting literature


Interesting links

- CWTS Leiden ranking: http://www.leidenranking.com/ranking/2016/list
- U-Multirank: http://www.umultirank.org
Acknowledgements

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Research Coordination Office

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