



European Council of Applied Sciences,  
Technologies and Engineering

***Draft***

**"Ranking in Engineering Sciences"  
Final Report**

By the Core Group Engineering Education

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Considering the globalisation of higher education and the European integration, the Core Group Engineering Education decided to run activities on global or European ranking systems of universities. As surveys show, global university rankings play an important role in students' assessments of universities. Thus, universities should pay more attention to university rankings.

There are a number of different international rankings, all of which apply different criteria. The two most prominent among them are the Shanghai Ranking from the Chinese Shanghai Jiao Tong University and the English Times Ranking from the Times Higher Education. These rankings are based on the universities' research performance and reflect mainly the quantity or the density of citation. They are called biometric rankings. Another way of University Ranking is based on peer reviews.

The Core Group was interested in looking at the usefulness of rankings regarding engineering sciences. This report contains information on different initiatives dealing with university ranking as well as references to organisations and reports for further research ambitions. Furthermore, a final statement reflects the opinion of the Core Group members based on the activities of the last years.

## 1. University Rankings

### *Leiden Ranking*

The Centre for Science and Technology Studies (CWTS), Leiden University, has developed a ranking system based on its own bibliometric indicators. The ranking focuses on universities worldwide with more than 700 Web of Science indexed publications per year. About 1000 universities - the largest in terms of number of publications in the world - are covered.

A member of the Core Group visited the 3rd International Symposium on University Rankings "Ranking and Differentiation in Higher Education, Research and Knowledge Utilisation" which took place on 6 and 7 February 2009 in Leiden. The conference addressed recent issues in the field of global university rankings. It is the third time that Leiden University has organised this event.

University rankings as instruments to measure excellence were discussed controversially at the conference. Most participants stressed the importance of ranking in a globalised higher education system. Another point of view was the difficulty of comparing different higher Education Systems and different environments of national Education Systems.

Another important question were the impacts of ranking. Many speakers considered especially the incentives of different ranking systems. Especially the incentives of different ranking systems draw the attention of many speakers. The impacts on institutions, on legislation, on public policy, on funding and on knowledge structuring were addressed in this context.

#### Links:

- Leiden Conference 2009 (speakers and PowerPoint presentations)  
<http://www.events.leiden.edu/ranking2009/>
- The Leiden Ranking 2008  
<http://www.cwts.nl/ranking/>

### *Wissenschaftsrat (German Council of Science and Humanities)*

The Wissenschaftsrat (German Council of Science and Humanities) is an advisory body to the Federal Government and the state (Länder) governments. The Wissenschaftsrat issues

statements, publishes recommendations and prepares reports which concern questions relating to the system of higher education. Furthermore the Wissenschaftsrat selects structural aspects of research and teaching as well as the strategic planning and assessment of specific fields and disciplines.

In November 2004, the German Council of Science and Humanities published the concept for a research rating procedure and recommended testing this procedure through a pilot study. According to a decision made in July 2005, the pilot study was conducted for the disciplines of chemistry and sociology. The study was taken up in fall 2005 and concluded early 2008.

The novel research rating is based on "informed peer review" procedure based on quantitative and qualitative comparative data and taking into account context information. Thereby the research rating system is supposed to be adaptable to disciplines with very different research practices, as chemistry and sociology.

As a next step, the research rating system will be conducted for two more disciplines, one from the humanities and one from the technical sciences. The results will be published in winter 2010 / 2011.

#### Publications:

- Wissenschaftsrat: Recommendations for rankings in the system of higher education and research Part 1: Research, November 2004  
<http://www.wissenschaftsrat.de/texte/6285-04-engl.pdf>
- Wissenschaftsrat: Steering Group Report on the Pilot Study Research Rating in Chemistry and Sociology, December 2008  
[http://www.wissenschaftsrat.de/texte/pilot\\_8893-08\\_steering-group.pdf](http://www.wissenschaftsrat.de/texte/pilot_8893-08_steering-group.pdf)
- Wissenschaftsrat: Research Performance of German Universities and nonuniversity Institutions in Chemistry, December 2008  
[http://www.wissenschaftsrat.de/texte/pilot\\_8892-08\\_chemistry.pdf](http://www.wissenschaftsrat.de/texte/pilot_8892-08_chemistry.pdf)

#### Links:

- Wissenschaftsrat homepage  
[http://www.wissenschaftsrat.de/engl\\_start.htm](http://www.wissenschaftsrat.de/engl_start.htm)

#### *TU9 - Nine Major Technical Universities in Germany*

TU9 is an university association of nine major Technical Universities in Germany. The universities are leading in engineering in Germany and are holding an outstanding position in the natural sciences. The cooperation includes the universities RWTH Aachen, TU Berlin, TU Braunschweig, TU Darmstadt, TU Dresden, Leibniz Universität Hannover, Universität Karlsruhe (TH), TU München and Universität Stuttgart.

The TU9 publishes annual report, statistical evaluations and reviews. One of its projects addresses the question of a ranking system of European Technical Universities. A first overview has been published and a detailed report will follow in 2010.

#### Publications:

- "Rankings - Eine Übersicht", April 2008  
[http://www.tu9.de/media/docs/tu9/200804\\_TU9\\_Papier\\_zu\\_Rankings.pdf](http://www.tu9.de/media/docs/tu9/200804_TU9_Papier_zu_Rankings.pdf)

#### Links:

- TU9: Ranking in Engineering Sciences  
<http://www.tu9.de/projekte/3111.php>

## 2. National Initiatives on Questions of Excellence

### *Royal Academy of Engineering, UK*

The report "Measuring Excellence in Engineering Research" published by the Royal Academy of Engineering in January 2000 is the distillation of findings by a working party of academic and industrial engineers, which was chaired by Philip Ruffles. The report proposes a methodology which addresses the demands of measuring engineering research excellence. The report states that research must be assessed on an international as well as a national level to enable valid comparisons to be drawn on the true quality and value of the research effort.

#### Publication:

- Royal Academy of Engineering: "Measuring Excellence in Engineering Research", January 2000

### *Evaluation of the Engineering Education in Norway*

In 2008, an international review team evaluated the Norwegian University of Science and Technology (NTNU) Master of technology five year integrated programs. Based on the documentation provided and as a result of interviews, the team gives recommendations for improving the excellence of the university.

#### Publications:

- Helen Dannetun (and others): Evaluation of the Engineering Education at NTNU, Review Team Report, September 2008

#### Links:

- Norwegian University of Science and Technology homepage  
<http://www.ntnu.no/english>

### *Austrian Agency for Quality Assurance (AQA)*

The Austrian Agency for Quality Assurance (AQA) is an independent institution for quality assurance, evaluation and certification for the higher education sector. AQA develops and conducts quality assurance procedures in accordance with national and European standards. The report "Trends of Quality Assurance and Quality Management in Higher Education Systems" contains an analysis about European trends as well as approaches and practices of quality audits in Europe. Furthermore, the role of students as members of review teams is analysed and the relevance of employability for different disciplines is put into question.

#### Literature:

- Austrian Agency for Quality Assurance (AQA): Trends of Quality Assurance and Quality Management in Higher Education Systems, Vienna 2009  
To be downloaded at: <http://www.aqa.ac.at/>

#### Links:

- Austrian Agency for Quality Assurance (AQA) homepage:  
<http://www.aqa.ac.at/>
- Hochschulvergleich 2007 homepage  
<http://www.hochschulranking.ac.at/>

### 3. Final remarks

The Core Group is aware of the importance of ranking for the European higher education system. Nevertheless, it is difficult to compare different higher Education Systems and different environments of national Education Systems. Especially concerning Engineering Sciences.

One of the main questions concerning ranking in Engineering Sciences is the choice of criteria. The quality of research in engineering sciences cannot be measured by the quantity or the density of citation alone. The choice of the right criteria is very controversial: "Innovation" seems to be as important for measuring excellence as the quality of "research". The number of publications and citations seems to be less crucial than for example the number of start-ups, of patents or the financial volume.

Furthermore, it has to be taken into account that the different educational systems rely on different priorities in education systems. The research on the link between education, motivational structure and socio-cultural context is still missing on an international scale. Therefore the Core Group supports international and interdisciplinary activities in this field, such as the Interdisciplinary Workgroup on *The Future of Science Education and Technology Literacy* who held its first International Workshop in October 2009 in Berlin.

In this context, it needs to be discussed whether Europe needs one paradigm of excellence in technical science. It can be argued that the diversity of excellent science institutions is important as the unique selling point of the European education system.

The Core Group recommends to discuss the future of the European education system considering diversity. It follows the importance of an adequate ranking of European universities in the field of engineering. Any ranking system needs to address the differences in education systems and to outline the criteria for excellence in engineering sciences on a scientific basis.