The Academic Ranking of World Universities

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Introduction

The development of world-class universities has been a dream of the Chinese people for generations. At the 100th anniversary of Peking University in May 1998, the then president of China declared that the country should have several world-class universities—resulting in the 985 Project, which is especially for building world-class universities in China. In 1998, Shanghai Jiao Tong University was selected by the Chinese government to be among the first group of nine universities in the 985 Project. At that time, many top Chinese universities drew up their strategic goals as to become world-class universities, and most of them set up a timetable. Shanghai Jiao Tong University was no exception. As a professor and vice-dean of the School of Chemistry and Chemical Engineering of the University, I was accidentally involved in the strategic planning process of building Shanghai Jiao Tong University into a world-class university.

During the process, I asked myself many questions. What is the definition of a world-class university? How many world-class universities should there be globally? What are the positions of top Chinese universities in the world higher education system? How can top Chinese universities reduce their gap with world-class universities? In order to answer these questions, we started to benchmark top Chinese universities with world-class universities and eventually to rank the world universities.

From 1999 to 2001, Dr. Ying Cheng, two other colleagues and I worked on the project of benchmarking top Chinese universities with four groups of US universities, from the very top to ordinary research universities, according to academic or research performance and based on internationally comparable data. The main conclusions included that top Chinese universities were estimated to be in the position of 200 to 300 in the world. The results of these comparisons and analyses were used in the strategic planning process of Shanghai Jiao Tong University. Eventually, a consultation report was written and provided to the Ministry of Education of China.

The publication of the report resulted in numerous positive comments, many of which involved the possibility of making a real ranking of world universities. During the time, many friends from different parts of the world, who visited us for other purposes, learned about our study and encouraged us to do world rankings. They reminded us that not only in China but also universities, governments, and other stakeholders in the rest of the world are interested in the ranking of world universities. Therefore, I decided to undertake this project and we spent another two years until the Academic Ranking of World Universities (ARWU) was first completed in early 2003. In June 2003, the ARWU was published on our web site (http://www.arwu.org).

Methodologies of ARWU

The ARWU uses six objective indicators to rank world universities. The indicators and its weights are the number of alumni winning Nobel Prizes and Fields Medals (10%), number of staff winning Nobel Prizes and Fields Medals (20%), number of highly cited researchers selected by Thomson Scientific (20%), number of
articles published in journals of Nature and Science (20%), number of articles indexed in Science Citation Index—Expanded and Social Sciences Citation Index (20%), and per capita performance with respect to the size of an institution (10%).

We have scanned every institution that has any Nobel Laureates, Fields Medals, Highly Cited Researchers, or articles published in Nature or Science. In addition, major universities of every country with significant amount of articles indexed by Science Citation Index-Expanded (SCIE) and Social Science Citation Index (SSCI) are also included. In total, more than 2,000 institutions have been scanned, and about 1,200 institutions have actually been ranked. A list of the top 500 institutions has been published on the Web. Considering the significance of differences in the total scale, the ARWU results include groups of 50 institutions in the range of 100 to 200 and groups of 100 institutions in the range of 200 to 500.

**ARWU-FIELD & ARWU-SUBJECT**

Ever since its publication, the ARWU has attracted attention from all over the world. Numerous requests have been received, asking us to provide a ranking of world universities by broad subject fields/schools/colleges and by subject fields/programs/departments. We have tried to respond to these requests.

In February 2007, the Academic Ranking of World Universities by Broad Subject Fields (ARWU-FIELD) was published on our web site. The five broad subject fields include the natural sciences and mathematics, life and agriculture sciences, engineering/technology and computer sciences, clinical medicine and pharmacy, and the social sciences. Arts and humanities are not ranked because of the technical difficulties in finding internationally comparable indicators with reliable data. Psychology and other cross-disciplinary fields are not included in the ARWU because of their interdisciplinary characteristics. Similar to the ARWU, institutions are ranked according to their academic or research performance in each broad subject fields. Besides the indicators used in ARWU, two new indicators were introduced: (a) the percentage of articles published in the top 20 percent journals of each broad subject field and, (b) the research expenditures (for engineering ranking). The list of top 100 universities in each broad field was published.

In October 2009, the Academic Ranking of World Universities by Subject Fields (ARWU-SUBJECT) was published, which ranks institutions in five subject fields, including Mathematics, Physics, Chemistry, Computer Sciences and Economics/Business. The list of top 100 universities in each subject was published.

**Impact of ARWU**

Although the initial purpose of ARWU was to find the global standing of Chinese top universities, it has attracted a great deal of attention from universities, governments and public media worldwide. A survey on higher education published by The Economist in 2005 commented ARWU as "the most widely used annual ranking of the world's research universities". Burton Bollag, a reporter at Chronicle of Higher Education wrote that ARWU "is considered the most influential international ranking".

One of the factors for the significant influence of ARWU is that its methodology is globally sound and transparent. The EU Research Headlines reported the ARWU work on 31st December 2003: "The universities were carefully evaluated using several indicators of research performance." Chancellor of Oxford University, Chris Patten, said "the methodology looks fairly solid ... it looks like a pretty good stab at a fair comparison." The ARWU and its content have been widely cited and employed as a starting point for identifying national strengths and weaknesses as well as facilitating reform and setting new initiatives. Martin Enserink referred to ARWU and argued in his paper published in Science that "France's poor showing in the Shanghai ranking ... helped
trigger a national debate about higher education that resulted in a new law... giving universities more freedom”.

**Ongoing Efforts to Diversify the ARWU**

The ARWU tried to rank research universities in the world by their academic or research performance based on internationally comparable third-party data that everyone could check. No subjective measures were taken. It was done independently for our academic interests, with potential applications in the strategic planning of Chinese universities. Nevertheless, there are still many methodological and technical problems.

Methodological problems involve the balance of research with teaching and service in ranking indicators and weights—including inclusion of non-English publications, the selection of awards, and the experience of award winners. Technical problems exist in the definition and name expression of institutions, data searching and cleanup of databases, and attribution of publications to institutions and broad subject fields. We have been working hard to study all the above-mentioned problems and to improve our ranking.

In addition to the field ranking and subject ranking, we are surveying the possibilities of providing more diversified ranking lists, particularly rankings based on different types of universities with different functions, disciplinary characteristics, history, size, and budget, as well as other topics. Furthermore, we have been doing theoretical research on ranking in general, seeking to contribute to the understanding of ranking. We have also been actively participating in international societies and communities related to ranking, such as the International Ranking Expert Group (IREG)—International Observatory on Academic Ranking and Excellence (http://www.ireg-observatory.org).