

# Developing National Ranking for Indian Universities: Moving towards World Class Universities

Dr. Jagdish Arora, Director and Ms. Kruti Trivedi, Scientist B(LS)

This article describes important university ranking systems along with indicators and methodology deployed by them for ranking universities. The shortcomings of these ranking systems are highlighted. The article describes I-UGR system of ranking developed for ranking universities in Spain and elaborates on its formula. Finally, the article describes why I-UGR system of ranking universities could also be used for ranking universities in India.

## 1. Preamble

The Higher education system in India is large and complex. India has the third largest higher education system in the world, behind China and the United States comprising of more than 700 universities, 39,000 affiliated colleges, 7 lakhs professors and 15 crores students including 17 lakhs post-graduate and 1.18 lakhs research students. The total enrolment has increased from a meager 0.1 million in 1947 to 13.64 million in 2010. Colleges, affiliated to 131 affiliating universities, constitute the bulk of the higher education system in India contributing around 86.88 % of the total enrolment.

The higher education system in India is in need of infusion of quality and clarity on the approach of building world-class university in the Indian context and environment. New benchmarks of quality need to be defined and put in place to help overall system to move up on the quality spectrum. Research assessment and national ranking of Indian universities can play an important role in improving performance and quality of academic institutions.

In view of global world Class University ranking, India's higher educational institutions figure poorly. None of the Indian higher education institutions were able to position top 200 in reputed ranking such as Times Higher Education World University Rankings, Academic Ranking of World Universities compiled by Shanghai Jiao Tong University, and Quacquarelli Symonds World University Rankings. Total four Indian institutes figure in the Times Higher Education (THE) World University Rankings 2013-14. Panjab University ranks between 226-250 while, four Indian Institute of Technology (IIT) namely IIT Delhi, IIT Kanpur, IIT Kharagpur and IIT Roorkee rank between 351 -400. Around 11 Indian institutes figure in the top 800 in QS World University Rankings 2013 with the highest ranking of IIT Delhi which is placed at 222 positions. IIT Bombay ranks 233 and IIT Kanpur ranks 295. The other Indian institutes figure in the top 800 list of QS World University Rankings 2013 includes IIT Madras (313), IIT Kharagpur (346), IIT Rourkee (401), Delhi University (441), IIT Guwahati and Mumbai University both at (601) and University of Pune and Kolkata at (701). Indian Institute of Science (IISc) is the only institution that figures between 301 and 400 in the Academic Ranking of World Universities (ARWU) compiled by Shanghai Jiao Tong University for 2013.

Robinson-García, et al (2013) observed dominance of the United States and the United Kingdom which alone represent more than a third of the universities included in the ranking (37.6%), followed by Germany and Canada as

the next with the highest number of universities included. The only exception being Japan (University of Tokyo), which is included amongst top 20 universities in the world ranking. Robinson-Garcia further observed high visibility of Anglo-Saxon universities in rankings leaving little space for other countries that are working towards a successful university model. In fact, most ranking system are incapable of giving justification to ranking of national university systems with exhaustiveness since most of them restrict themselves to rank 500 to 1000 universities.

As such, the existing international rankings do not offer a complete view of our national higher education systems, preventing policy makers, funding agencies and other regulatory bodies to assess the real state of education in the country and have glimpses of accurate picture of the state of country's university system and colleges affiliated to them. As such, there is a need to develop tools with higher levels of granularity and accuracy and to rank universities and colleges in India. However, it is important that a well-balanced, multidimensional approach, combining qualitative and quantitative indicators is deployed for ranking universities in India consisting of optimal numbers of performance indicators.

This article describes important university ranking systems along with indicators and methodology deployed by them for ranking universities. The shortcomings of these ranking systems are highlighted. The article describes I-UGR system of ranking developed by Robinson-García, et al (2013) for ranking universities in Spain and elaborates on its formula. Finally, the article describes why I-UGR system of ranking universities in Spain could also be used for ranking universities in India.

## 2. World Rankings of Universities

There are a number of reputed globally-recognized rankings of the world universities. A brief description of these ranking system and indicators used by them is given below.

### 2.1. Shanghai Jiao Tong University Academic Ranking of World University (ARWU)

The Academic Ranking of World Universities (ARWU) is first published in June 2003 by the Centre for World-Class Universities and the Institute of Higher Education of Shanghai Jiao Tong University, China, and updated on an annual basis. The ranking compared 1,200 higher education institutions worldwide and publish 500 of them.

Criteria	Indicators	Weight
Quality of Education	Alumni of institution winning noble prizes and field medals	10%
Quality of Faculty	Staff of institution winning noble prizes and field medals	20%
	Highly cited researchers in 21 broad subject categories	20%
Research Output	Article published in Nature and Science	20%
	Article indexed in Science Citation Index-expanded and Social Science Citation Index	20%
Per Capita Performance	Per Capita Performance	10%

### 2.2. QS World University Rankings

The QS World University Rankings is a ranking of the world's top 500 universities by Quacquarelli Symonds since

2004. The QS rankings were originally published in collaboration with Times Higher Education, and was known as the THE-QS World University Rankings. QS assumed sole publication of the existing methodology and Times Higher Education split in order to create a new ranking methodology in 2010, which became the THE World University Rankings.

Criteria	Indicators	Weight
Public Perception	1. Academic Reputation Survey	40%
	2. Employer Reputation Survey	10%
	3. Reputation Ranking by Faculty / Subjects	
Faculty Student Ratio	Score based on Student-Faculty Ratio	20%
Citation per Faculty	Research Performance factored against size of researchers	20%
International Faculty	Proportion of International Faculty	5%
International Students	Proportion of International Students	5%

### 2.3. Times Higher Education World University Rankings

The Times Higher Education World University Rankings is an international ranking of the world's top universities published by Times Higher Education (THE). A publisher of international education rankings since 2004, THE split from its original partner Quacquarelli Symonds in 2010, creating a new ranking methodology whose citation database information is compiled in partnership with Thomson Reuters. The additional World Reputation Rankings which are independent of the main rankings have also been released starting from 2011.

Criteria	Indicators	Weight
International Outlook (7.50%)	International / Total Students Ratio	2.50%
	Total Academic Ratio	2.50%
	Scholarly papers with at least one International Author / Total Papers	2.50%
Research- Volume (30%)	Publications Scholarly Papers/Academic & Research Staff	30%
Teaching - Learning	Staff-to-Student Ratio Ph.D. / UG Degrees Awarded	30%
Environment	Ph.D. Awarded / Academic Staff	
Research Impact - Citations	Total Citations Average Citations	30%
Industry Income	Industry Income	2.50%

### 2.4. The Leiden Ranking

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

Criteria	Indicators
Impact indicators	Mean citation score
	Mean normalized citation score
	Proportion of top 10% publications
Collaboration indicators	Proportion of inter institutional collaborative publications
	Proportion of international collaborative publications
	Proportion of collaborative publications with industry
	Mean geographical collaboration distance

## 2.5. Webometrics

Webometrics, an initiative of the Cybermetrics Lab (Spain), has produced the 'World Universities Ranking on the Web' since 2004, measuring the web presence of universities around the world and comparing the size and scale of their web presence against expectations based on other rankings. The Webometrics ranking is updated every six months, with data collection occurring in January and July, and the results of the data analysis are published a month later. Important changes have been introduced in the Webometrics ranking methodology in 2012. The indicators correlate web measures with traditional scientometric and bibliometric indicators used in other rankings.

Indicators	Meaning	Weight
Impact	Number of backlinks (from Majestic SEO)	50%
	Number of backdomains (from Majestic SEO)	
Presence	Number of (all) web pages from Google	20%
Openness	Number of papers from Google Scholar (2007-11) <i>pdf, doc, docx, ppt</i>	15%
Excellence	Number of papers belonging to the top 10% of cited papers from the SCImago database (2003-10)	15%

## 2.6. NTU Ranking

The Performance Ranking of Scientific Papers for World Universities, introduced in 2007, was a ranking system of 500 world universities by scientific paper volume, impact, and performance output. The ranking was published by the Higher Education Evaluation and Accreditation Council of Taiwan (HEEACT). After 2012, HEEACT Taiwan Ranking of Scientific paper was known as National Taiwan University Ranking. The NTU Ranking evaluates and ranks performance in terms of the publication of scientific papers for the top 500 universities worldwide using data drawn from SCI and SSCI.

Criteria	2012 Overall Performance Indicators	Weight	
		Research productivity	Number of articles in the last 11 years (2001-2011)
Research impact	Number of articles in the current year (2011)	15%	
	Number of citations in the last 11 years (2001-2011)	15%	35%
	Number of citations in the last two years (2010-2011)	10%	
Research excellence	Average number of citations in the last 11 years (2001-2011)	10%	
	h-index of the last two years (2010-2011)	20%	40%
	Number of Highly Cited Papers (2001-2011)	15%	
	Number of articles in the current year in high-impact journals (2011)	15%	

## 2.7. The SCImago Institutional Rankings (SIR)

The Scimago Institutions Rankings, launched in 2009, was developed by SCImago Research Group, a Spain-based research organization consist of members from the Spanish National Research Council (CSIC), University of Granada, Charles III University of Madrid, University of Alcalá, University of Extremadura and other education institutions in Spain. The ranking covers only research at higher education institutions and other research establishments. The ranking measures areas such as: research output, international collaboration, normalized impact and publication rate. The ranking can be customized on the basis of needs and interests.

Indicators	Explanation
Output (O) International collaboration (IC)	Number of scientific papers published in scholarly journals Proportion of articles whose affiliations include more than one country address
Normalized impact (NI)	Normalized impact indicator values show the ratio between the average scientific impact of an institution and the world average impact of publications for the same time, document type and subject area
High quality publications (Q1)	Ratio of publications of an institution which are published in the journals ranked in the first quartile (25%) in the SCImago Journal Rank (SJR) indicator
Specialization index (SI)	This indicator is calculated in the same way as the Gini index in economics (see below). The value of the Gini index is between 0 and 1. Here, the value 1 means that the institution has publications in one field only, i.e. it is absolutely specialized; small index values mean that the institution is a comprehensive one
Excellence rate (ER)	The indicator value is the proportion of an institution's journal publications included in the 10% most cited papers in the same scientific field
Scientific Leadership	Indicator value is the number of papers in which the corresponding author belongs to the institution

SCImago country rankings enable countries to be compared using each of the following indicators:

- ❖ Total count of documents = total publication output of a country including citable and non-citable documents;
- ❖ Count of citable documents;
- ❖ Citations count;
- ❖ Self-Citations count;
- ❖ Citations per Document; and
- ❖ h-index.

### 3. Flaws in World University Ranking Systems

---

Major flaws in World university ranking systems are as follows:

- i) Major responsibility of universities is to inform, inspire and engage students.
- ii) The idea of quality of education is too intangible to measure. All rankings use proxies for these qualitative indicators.
- iii) Indicators used by all rankings include research articles, citation counts, faculty size, graduation rates and institutional reputation that are proxy to quality.
- iv) Emphasis is on research over teaching. None of the ranking consider factors like social responsibilities of universities or student and alumni opinions.
- v) Some of the indicators used in world ranking are not even remotely applicable to Indian universities for example Nobel Prize Winners amongst alumni and faculty, articles published in Nature and Science, International faculty, etc.
- vi) There are approx. 16,000 universities in the world. Most rankings consider top 500 or 800 universities.
- vii) International rankings cannot reflect the state of national higher education systems as they usually cover just the top universities of each country. India itself has 700+ universities. Most small but high quality universities do not even qualify for preliminary rounds of measurements.
- viii) Most international rankings have Anglo-Saxon bias. 37.6% universities in Shanghai Ranking are from USA and UK.

### 4. I-UGR Ranking Formulae for Ranking Universities

---

I-UGR formula was developed considering the fact that in 2013 editions of various world ranking of universities only 19 out of 74 universities (25.68%) figured amongst world class universities. It is believed that various countries are poorly represented in the international rankings because of limited number of universities that are considered as World-Class universities. Robinson-García, et al (2013) believed that limited coverage of Spanish universities do not offer a complete picture of the university system in Spain for policy makers. As such, a national ranking system is required to complete fragmented picture of the Spanish higher education scenario.

IFQ<sup>2</sup>A Index was developed as an indicator to measure the quantitative and qualitative dimensions of the research outcome of a group of institutions in a given field. It is based on the following six primary bibliometric indicators that reflect upon research activity, impact and visibility of universities:

**Quantitative Indicators (QNIF):** Size-dependent measures

- i) NDOC: Number of citable papers published in scientific journals
- ii) NCIT: Number of citations received by all citable papers
- iii) H: H-Index

$$QNIF = \sqrt[3]{NDOC \times NCIT \times H}$$

**Qualitative Indicators (QLIF):** Size-independent, relative measures of impact and visibility

- i) %1Q: Ratio of papers published in journals in the top JCR quartile
- ii) ACIT: Average number of citations received by all citable papers
- iii) TOPCIT: Ratio of papers belonging to the top 10% most cited papers calculated within all institutions

$$QLIF = \frac{\sqrt[3]{\%1Q \times ACIT \times TOPCIT}}{IFQ^2 A = QNIF \times QLIF}$$

#### 4.1. Why to Use I-UGR Ranking for Ranking Indian Universities?

The formula used by I-UGR takes care of most of the limitations that exist in international ranking system. Indicators used in the I-UGR are not restrictive to few universities. In contrast, these indicators apply to all universities. For example, number of Nobel prize winners may not be applicable to any university in India, likewise number of articles published in Nature and Science as an indicator to measure research excellence may be applicable only to very few universities in India. Indicators used in I-UGR formulae measure both quantitative as well as qualitative dimensions of the research outcome of universities. I-UGR is size-independent since it uses bi-dimensional index, which takes into account raw counts of papers and citations as well as relative measures that benefit small institutions which produce high quality papers.

I-UGR takes into account the disciplinary focus and multi-dimensional nature of universities, an important feature considering the fact that India has discipline focused educational institutions such as IITs, IISERs, IISc, NITs, AIIMS, IIITs, IIMs and several others discipline special universities.

In order to give equal treatment to older and new institutions, I-UGR takes a window of most recent 5 or 10 years so as to give equal treatment to newer and older institutions. 5 to 10 years time span also offer stable results. Merits of I-UGR ranking are as follows:

- i) The formula is transparent and replicable.
- ii) International rankings cannot reflect the state of national higher education systems as they usually cover just the top universities of each country.
- iii) Most international rankings have Anglo-Saxon bias. 37.6% universities in Shanghai Ranking are from USA and UK.
- iv) Indicators used in I-UGR formulae measure both quantitative as well as qualitative dimensions of the research outcome of universities.
- v) I-UGR is size-independent since it uses bi-dimensional index which takes into account raw counts of papers and citations as well as relative measures which benefit small institutions that produce high quality papers.

- vi) I-UGR takes into account the disciplinary focus and multi-dimensional nature of universities.
- vii) Indicators used in the I-UGR are not restrictive to few universities. It applies to all universities. For example No. of Nobel prize winners and no. of articles published in Nature and Science as an indicator to measure research excellence may or may not be applicable to most of the universities in India.
- viii) I-UGR takes a window of most recent 5 or 10 years so as to give equal treatment to newer and older institutions. 5 to 10 years time span also offer stable results.

## 5 Conclusion

The paper explores the possibility of National Ranking of Indian Universities using IFQ2A index. It can be seen that most of the international rankings focus predominantly on indicators related to the research performance of universities. 40% to 60% weightage is given to research performance indicator. It is therefore meaningful in the initial exercise to focus on the research contributions of higher educational institutions (HEIs) in India. The IFQ2A Indexes address a comprehensive research analysis of the university system of a country. Using IFQ2A Ranking at national level, India can focus on quality and quantity of research at Indian Institutes which is the highly weighted indicators in World University Ranking.

## 6. References

1. Jeremic, V., and Jovanovic-Milenkovic, M., Evaluation of Asian university rankings: position and perspective of leading Indian higher education institutions. *Current Science*, vol. 106 (12). 2014
2. Robinson-Garcia, N., et al. An insight on the importance of national university rankings in an international context: The case of the I-UGR Rankings of Spanish universities. *Scientometrics*, March 2014.
3. Rauhvargers, A., Global University Rankings and their Impact, Report II, European University Association, 2013; [http://www.eua.be/Libraries/Publications\\_homepage\\_list/EUA\\_Global\\_University\\_Rankings\\_and\\_Their\\_Impact\\_-\\_Report\\_II.sflb.ashx](http://www.eua.be/Libraries/Publications_homepage_list/EUA_Global_University_Rankings_and_Their_Impact_-_Report_II.sflb.ashx) (accessed 14th August 2014).
4. <http://www.topuniversities.com/university-rankings>
5. <http://www.webometrics.info/en>
6. <http://www.shanghai ranking.com/>
7. <http://www.timeshighereducation.co.uk/world-university-rankings/>
8. <http://www.leidenranking.com/>
9. <http://www.scimagoir.com>
10. <http://nturanking.lis.ntu.edu.tw/Default-TW.aspx>