STM JOURNALS

A Critical Evaluation of Ranking of Indian Universities among Global Universities based on ARWU Shanghai Rankings 2019

*Hardev Singh Virk**

Ex-Professor of Eminence, Punjabi University, Patiala, Punjab, India

Abstract

Academic ranking of world universities (ARWU) 2019 was released on 15 August for 2019 by the Shanghai Ranking Consultancy of China. ARWU has been presenting the world top 500 universities annually since 2004. It is unfortunate that none of the Indian universities and Indian Institute of Technology (IITs) find a slot among the top 500, except Indian Institute of Science (IISc), Bangalore. USA has 45 universities among top 100, Europe has 33, Asia has 10, Australia has 7, Canada has 4 and Russia has one university among top 100. In subject-wise ranking, Punjab University, Chandigarh finds a slot among top 201–300 in the subject of Physics. In Agriculture, Biological Sciences, Social Sciences and Education, India's performance is dismal and none of the Indian universities are ranked among top 500.

Keywords: Academic ranking of world universities (ARWU), Shanghai ranking, Indian universities, Indian Institute of Technology (IITs), subject-wise ranking

***Author for Correspondence** E-mail: hardevsingh.virk@gmail.com

INTRODUCTION

Shanghai rankings of global universities [1], publisher of Academic Ranking of World Universities (ARWU), has been released on 15th August for 2019. ARWU started its journey of global university ranking in 2003. The editor of Current Science [2] took notice of poor performance of Indian universities in 2004 and wrote an editorial with his critical remarks: "I found the Shanghai rankings provocative and disturbing. It is clear that academic ambience of our large institutions is decaying. The government which funds these institutions and the bodies that govern them need to take a long, hard and critical look at the higher education scene in India". I have been analysing the ARWU reports since its inception [3–5].

An analysis of Shanghai rankings 2019 revealed that Indian universities and Indian Institute of Technology (IITs) do not find any slot among top 500 universities at global level. Among top 10 universities in world ranking, eight slots are occupied by the US universities with Harvard and Stanford ranking first and second as usual for the past three years (2017–

19). The Universities of Cambridge and Oxford in UK maintain their status quo occupying third and seventh slot, respectively. Among top 100 universities ranked globally, 45 belong to USA, 33 to Europe (including eight of UK, five of Switzerland, four of Germany, three of France), seven to Australia, four to Canada, four to China, three to Japan, two to Singapore, and one to Israel. During the past three years (2017–19), ARWU rankings of Universities of USA, Europe and Australia have shown consistency and the same holds good for the Asian giants (China, Japan and Korea) in academia. The only problem is with Indian universities missing slots among the top 500; the only saving grace is Indian Institute of Science (IISc), Bangalore ranked among 401–500 of Shanghai ranking.

Another shocking revelation is that small Asian countries such as Singapore, Hong Kong, Taiwan, Israel, and Saudi Arabia are performing much better than India in global ranking. Three universities of Saudi Arabia (King Abdul Aziz, King Saud and King Abdulla of S &T) are ranked higher than IISc, Bangalore. Islamic Republic of Iran with 13
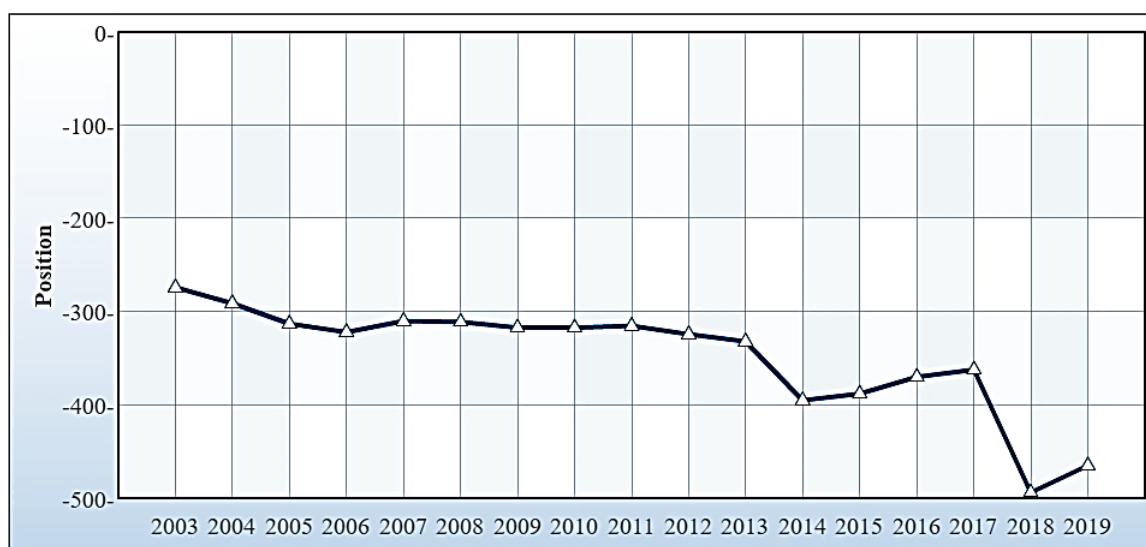
Fig. 1: *Academic Ranking in World Universities from 2003 to 2019 of Indian Institute of Science, Bangalore.*

Universities among Top 1000 is competing favourably with India. The dismal picture of Indian universities is represented by the falling graph of IISc, Bangalore (Figure 1)—the topmost Indian Institution for research in areas of Natural Sciences & Engineering.

What about ranking of Indian Universities among top 1000 at the global level? We have 16 institutions among this list (Table 1): IISc Bangalore is at the top (ranked 401–500), followed by IIT Madras (501–600), IIT Kanpur and University of Calcutta (601–700), IITs Bombay, Delhi, Kharagpur and University of Delhi (701–800), Indian Institutes of Science Education & Research (IISER) Kolkata and Jawaharlal Nehru University (JNU) Delhi (801–900), and All India Institute of Medical Sciences (AIIMS) Delhi, Anna Madras, Banaras Hindu University (BHU) Varanasi, Bharathiar Coimbatore, IIT Roorkee and Vellore Institute of Technology (VIT) Vellore (901–1000). Among traditional Indian Universities, only four (Calcutta, Delhi, JNU and BHU) find a slot among top 1000 in global ranking. Punjab University (PU), Chandigarh and Jadavpur University, Kolkata were ranked among top 1000 in 2018 ranking but these do not find a slot among top 1000 in 2019 ranking. However, three new universities (Anna, Bharathiar and VIT) enter as newcomers from India among the list of 2019 ranking.

If we look into the subject ranking [6] in the ARWU list of top 500 universities, we have some big surprises. In Physics, PU Chandigarh tops the list from India with ranking of 201–300 among top 500 universities, followed by IISER Kolkata, IITs Bombay, Madras, Hyderabad, and Visva-Bharati (Shanti Niketan) ranked among top 401–500. In Chemistry, IISC Bangalore, IITs Bombay, Kanpur, Kharagpur and IISER Pune find a slot among top 500 in ARWU list. In Nanoscience & Nanotechnology, IISC Bangalore (151–200), IITs Bombay, Delhi, Madras, and Kharagpur are ranked among 301–400 in ARWU list. In Civil Engineering, IITs Bombay, Delhi, Kharagpur, Madras and Roorkee are ranked among top 201–300. In Materials Science and Engineering, IIT Kharagpur, Madras and Bombay occupy a slot among top 500. In Energy Science and Engineering, IISC Bangalore, IITs Bombay, Delhi, Kanpur, Madras and Roorkee are ranked among top 500 at global level.

The situation is far from satisfactory in Agricultural, Life/Biological Sciences, and Social Sciences. None of the Indian universities occupy any slot among top 500 in Shanghai global ranking. The only saving grace is Indian Statistical Institute, Kolkata which has been ranked among top 301–400 in the subject of Economics. In Pharmacy and Pharmaceutical Sciences, Jamia Hamdard,

Delhi is ranked among top 301–400 and University of Delhi among top 401–500 in global ranking. In Clinical Medicine, Sanjay Gandhi Postgraduate Institute of Medical Sciences (PGIMS), Lucknow is ranked among top 201–300, Christian Medical College (CMCH) Vellore among top 301–400, and BHU Varanasi among top 401–500. India boasts of one of the biggest network in the field of higher education but to our dismay, none of the Indian universities finds a slot among top 500 in the subject of Education.

Table 1: Indian Universities Rank in Academic Ranking of World Universities (2019).

World Rank	Institution*	By location India	National/Regional Rank	Total Score	Score on PUB
401–500	Indian Institute of Science		1		42.7
501–600	Indian Institute of Technology Madras		2		32.2
601–700	Indian Institute of Technology Kanpur		3–4		25.8
601–700	University of Calcutta		3–4		20.4
701–800	Indian Institute of Technology Bombay		5–8		29.3
701–800	Indian Institute of Technology Delhi		5–8		29.3
701–800	Indian Institute of Technology Kharagpur		5–8		32.1
701–800	University of Delhi		5–8		27.8
801–900	Indian Institutes of Science Education and Research (IISERs)		9–10		25.7
801–900	Jawaharlal Nehru University		9–10		19.0
901–1000	All India Institute of Medical Sciences		11–16		24.0
901–1000	Anna University		11–16		24.6
901–1000	Banaras Hindu University		11–16		24.7
901–1000	Bharathiar University		11–16		18.5
901–1000	Indian Institute of Technology Roorkee		11–16		26.0
901–1000	Vellore Institute of Technology		11–16		26.3

* Institutions within the same rank range are listed alphabetically.

Table 2: Ranking Indicators Used in ARWU Shanghai Ranking (2019).

Area	Indicator	Weight	Source
Publications (PUB)	The number of papers authored by an institution in an academic subject.	23.8–48.4%[1]	InCites
Category Normalized Citation Impact (CNCI)	Category Normalized Citation Impact from InCites database to measure average impact of papers authored by an institution in an academic subject.	12.2–31.3%	InCites
International Collaboration (IC)	The percentage of internationally collaborated papers authored by an institution in an academic subject.	2.4–6.3%	InCites
Papers published in top journals (TOP)	The number of papers published in top journals in an Academic Subject.	23.8–32.3%	The journals were identified through Shanghai Ranking's Academic Excellence Survey2 or Web of Science's Journal Citation Report (JCR)
Faculty awards (AWARD)	The total number of the staff of an institution winning a significant award in an academic subject.	0–24.4%	The awards were identified through Shanghai Ranking's Academic Excellence Survey[2]

Notes:
1. Different weights were allocated to the indicators for different subjects.
2. The Academic Excellence Survey is a survey of deans, chairs, and department heads of the Top 100 universities. The survey asks respondents to identify top journals and awards in their subject areas.

RANKING METHODOLOGY

For an institution to be included in any subject ranking, it needed to meet a threshold in terms of research publications during the period 2013–2017. It is noted that the threshold may be different for different subject areas. The rankings were then produced based on five weighted indicators (Table 2)—Publications (PUB), Category Normalized Citation Impact (CNCI), International Collaboration (IC), Papers published in top journals (TOP), and Faculty awards (AWARD) [7]. Different weights were allocated to the indicators for different subjects. For example, PUB accounted for 23.8% in Mathematics, Physics and a number of other subject areas, but 48.4% in Finance, Public Administration, Sociology, and Library and Information Science. Depending on the subject area, about 50 to 500 universities were ranked at the global level.

RANKING CRITERIA

It is a very complex process to evaluate the data presented by the universities or collected from the national database at global level. The ranking parameters are determined in consultation with more than 500 Professors from different countries in different subjects [1]. Global Research University Profiles (GRUP) is a comprehensive database and benchmarking tool covering 1500 research universities in the world. Based on the data reported by universities and collected from third parties, GRUP presents comparisons of universities in different rank ranges and/or in different geographic groups in terms of 40 indicators, allowing users to learn about the performance of their local and international peers for various purposes.

In 2018, some 467 universities reported their data on students, academic staff and resources. The participating universities cover 54% of the top 100 universities and 50% of other top 500 universities on the Academic Ranking of World Universities 2018; therefore they formed a representative sample set to describe and reflect the characteristics of world leading research universities. The GRUP platform 2018 also includes those data for 1500 universities that were used to calculate the Academic Ranking of World Universities 2018, including alumni and staff winning Nobel Prizes and Fields Medals, Highly Cited Researchers, papers in Nature and Science and Science Citation Index Expanded (SCIE)/ Social Science Citation Index (SSCI) papers.

GRUP serves as a benchmarking tool and allows users to view and compare statistics on the 40 indicators (13 indicators about students, nine indicators about faculty, 13 indicators about resources and five ARWU indicators) for universities in different rank ranges and/or

in different regions/countries. It not only provides comprehensive and quantitative descriptions of world leading research universities, but also helps universities to identify their advantages and disadvantages as compared to those of their concern.

The list of five ARWU indicators is given as follows:
1. Number of Alumni of Nobel Laureates and Fields Medalists;
2. Number of Staff of Nobel Laureates and Fields Medalists;
3. Number of Highly Cited Researchers;
4. Number of Nature and Science Papers;
5. Number of SCIE and SSCI Papers.

A Critical Analysis of ARWU Ranking of Indian Universities

The ranking is not absolute but a relative measure to assess the quality of universities. Indian universities have a large quantitative data base in research publications but suffer from lack of quality of publications under TOP and almost negligible representation under AWARDS category. There is a dire need to investigate the results of Shanghai ranking consultancy and determine the factors responsible for the poor performance of Indian universities and IITs at global level.

ARWU ranking of top universities like Harvard (USA) and Cambridge (UK) gives us an inkling into the dismal performance of Indian universities. Since the start of ARWU Shanghai Ranking in 2003, Harvard has been ranked as the 'TOPMOST' among global universities during all these years (Figure 2). In Life Sciences, Medical Sciences and Social Sciences, Harvard has been always occupying topmost position ever since 2007 to 2019; in Natural Sciences, its position varied from 1–4; and in Engineering Sciences from 35–37. In subject-wise ranking, Harvard has been at the top in Economics/Business; top 1–3 position in Physics; top 1–2 in Chemistry, and always at 3rd rank in Mathematics.

ARWU ranking of Cambridge University has been almost stable at number 3 during the past five years (Figure 3). In Natural Sciences, its position fluctuates from 4 to 7; in Engineering Sciences from 16 to 19; in Life Sciences its rank improved from 10 to 2 and in Medical Sciences from 15 to 4; but in Social Sciences, it has been stable at 16 ever since 2007. In subject-wise ranking, Cambridge has been showing fluctuations over the years 2009–2015 as follows: Mathematics 5–9; Physics 8–9; Chemistry 3–6; and Economics/Business almost stable at 18.
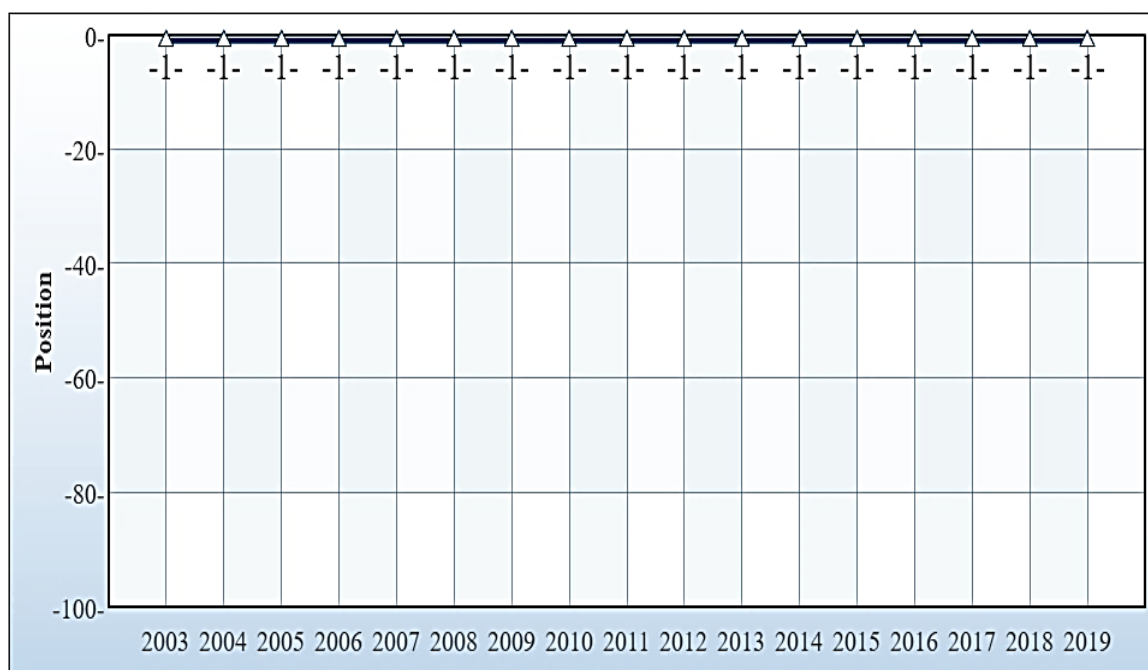

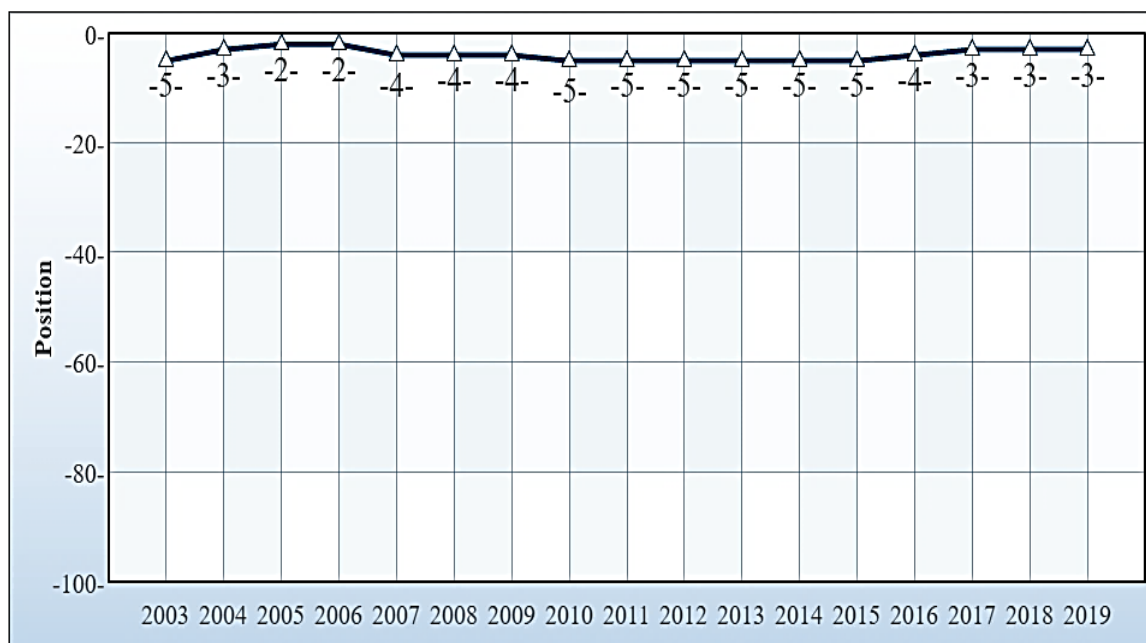*Fig. 2: Ranking of Harvard University (USA) among ARWU List (2019).*

Fig. 3: *Ranking of Cambridge University (UK) among ARWU List (2019).*

In consideration of ranking criteria listed in Table 2, and ARWU indicators given in section supra, Indian universities fail to qualify on some indicators, e.g., Awards. Out of 16 universities listed in Table 1, only Calcutta University scores 9.3% in Awards category. In Alumni category, again Calcutta University scores 11.2%; all others score zero. In category of highly cited faculty (HiCi), IITs Madras and Kanpur along with JNU Delhi score 7.3%. In category of papers published in Nature and Science (N & S), IIT Bombay scores 3.3% while IIT Roorkee scores zero. Indian universities performance is praise worthy in category of research papers published (PUB) in highly cited journals. IISc Bangalore scores 42.7%, IITs Madras and Kharagpur score 32.2% and 32.1%, respectively, and all others fall between 32.1 to 18.5% (Bharathiar, Coimbatore). It clearly shows that Indian universities need to reorient their academic programmes by entering into international collaborations in research and teaching.

The National Institutional Ranking Framework (NIRF) was approved by the MHRD and launched by the Minister of HRD in 2015. The first NIRF rankings were announced in 2016. According to NIRF 2019 [8], IISc is ranked at first position followed by JNU at second, BHU at third, University of Hyderabad at fourth, Calcutta University at fifth, Jadavpur University at sixth, Anna University at seventh, Amrita Vishwa Vidyapeetham at eighth, Manipal Academy of Higher Education at nineth and Savitribai Phule Pune University at tenth position. According to the officials, more than 4000 institutes had submitted their data for NIRF ranking this year.

I repeat my suggestions made last year [5]: "In my view, India needs to follow an alternative route to excellence. Instead of choosing a university as a unit, we must identify one hundred eminent scholars in each subject. These scholars should be provided liberal funding without any strings for setting up "Schools of Excellence" in their area of expertise. The scholar will act as a nucleus for the growth of his school. If Indian scholars are not available in any subject, offer can be made to foreign-based Indian or foreign scholars at their own terms and conditions. I suggest just one; there may be other routes to bring in excellence in Indian universities at global level".

Global Ranking of Academic Subjects (GRAS) 2019
Shanghai Ranking began to publish Academic Ranking of World Universities (ARWU) by

academic subjects since 2009. This release contains rankings of universities in 54 subjects across Natural Sciences, Engineering, Life Sciences, Medical Sciences, and Social Sciences. In total, more than 4000 universities were ranked.

Universities from the United States take top positions in 33 subjects, Chinese universities dominate in 11 subjects. The best performing institution is Harvard, taking 14 crowns, 7 of which are from Social Sciences subjects, 3 from Medical Sciences, 2 from Life Sciences, and 2 from Engineering. MIT tops 5 subjects, 4 of which are engineering subjects. Other universities who top more than one subject rankings include University of Pennsylvania and University of Colorado at Boulder from the United States and Nanyang Technological University from Singapore.

More than 1700 universities from 86 countries and regions are published in this release and are presented on the league table for a total of 19191 times. Universities from the United States appear 4808 times, followed by Chinese universities (2451 times) and universities from the United Kingdom (1554 times). University of Michigan-Ann Arbor, University of British Columbia, McGill University and the University of New South Wales are presented on the league table in 52 subjects.

What about GRAS ranking of Indian universities? India lags behind South Asian countries like China, Japan, South Korea, Singapore, Hong Kong and Malaysia. Other Asian countries who have surpassed India in GRAS are Israel, Saudi Arabia, Iran and Turkey. The only saving grace is ranking of Punjab University, Chandigarh among top 201–300 in the subject of Physics, Indian Statistical Institute, Kolkata among top 201–300 in Mathematics, IISc Bangalore and IIT Bombay among top 201–300 in Chemistry. The performance of Indian universities in Social Sciences is dismal, except in Economics.

GRAS Ranking indicators include measures of research productivity, research quality, extent of international collaboration, research with

top quality, and the highest academic recognitions. The bibliometric data are from Web of Science and InCites database produced by Clarivate Analytics. Academic award is a featured indicator of Shanghai Ranking's global rankings. In GRAS 2019, 26 awards identified by professors from world's Top 100 universities through Academic Excellence Survey are used, which cover 23 ranked subjects.

The National Institutional Ranking Framework (NIRF) 2019

The National Institutional Ranking Framework (NIRF) was approved by the MHRD and launched by Minister of HRD in 2015. The first NIRF rankings were announced in 2016. According to NIRF 2019 [8], Indian Institute of Science is ranked in 1st position followed by Jawaharlal Nehru University on 2nd, Banaras Hindu University on 3rd, University of Hyderabad on 4th, Calcutta University on 5th, Jadavpur University on 6th, Anna University on 7th, Amrita Vishwa Vidyapeetham, on 8th, Manipal Academy of Higher Education on 9th and Savitribai Phule Pune University on 10th. According to NIRF database, more than 4000 institutes had submitted their data for NIRF ranking this year.

The national ranking of universities in Punjab State is as follows: Punjab University, Chandigarh is ranked 21; Thapar Institute of Engg. and Technology (TIET), Patiala at 27; Punjab Agricultural University (PAU), Ludhiana at 51, Guru Nanak Dev University (GNDU), Amritsar at 55; and Central University of Punjab (CUP), Bathinda at 95 among Top 100 in NIRF Report 2019. Lovely Professional University (LPU), Jallandhar is ranked among top 101–150 and Punjabi University, Patiala ranked among 151–200 in the NIRF list.

I repeat my suggestions made last year: "In my view, India needs to follow an alternative route to excellence. Instead of choosing a university as a unit, we must identify one hundred eminent scholars in each subject. These scholars should be provided liberal funding without any strings for setting up

"Schools of Excellence" in their area of expertise. The scholar will act as a nucleus for the growth of his School. If Indian scholars are not available in any subject, offer can be made to foreign based Indian or foreign scholars at their own terms and conditions. I suggest just one; there may be other routes to bring in Excellence in Indian universities at global level" [5].

ACKNOWLEDGEMENT

REFERENCES

1. *Academic Ranking of World Universities*. Available from: http://www. shanghairanking.com/ARWU2019.html
2. Balaram, P. The Shanghai Rankings. *Curr Sci*. 2004; 86(10): 1347–8p.
3. Virk HS. Shanghai rankings and Indian universities. *Curr Sci*. 2004; 87(4): 416p.
4. Virk HS. Shangai rankings 2016: poor performance of Indian universities. *Curr Sci*. 2016; 111(4): 601p.
5. Virk HS. Shanghai Rankings 2018: Poor Performance of Indian Universities and IITs. *OmniScience: A Multi-disciplinary Journal*. 2018; 8(3): 6–10p.
6. Methodology-for-ShanghaiRanking-Global-Ranking-of-Academic-Subjects-2019. *Academic Ranking of World Universities*. Available from: http://www.shanghairanking.com/Shanghairanking-Subject-Rankings/Methodology-for-ShanghaiRanking-Global-Ranking-of-Academic-Subjects-2019.html
7. Shanghai Ranking's Global Ranking of Academic Subjects 2019. *University of Saskatchewan*; 2019 Jul. Available from: www.usask.ca/ipa.
8. MHRD NIRF 2019: Top Universities Ranking in India. *Bright Educational Services*; 2019 Apr 10. Available from: www.besonline.in/blog/mhrd-nirf-2019-top-universities.

Cite this Article

Virk HS. A Critical Evaluation of Ranking of Indian Universities among Global Universities based on ARWU Shanghai Rankings 2019. *OmniScience: A Multi-disciplinary Journal*. 2019; 9(3): 47–55p.

APPENDIX

Indicators and Weights for ARWU

Quality of Education	Alumni of an institution winning Nobel Prizes and Fields Medals	Alumni	10%
Quality of Faculty	Staff of an institution winning Nobel Prizes and Fields Medals	Award	20%
	Highly Cited Researchers	HiCi	20%
Research Output	Papers published in *Nature* and *Science**	N&S	20%
	Papers indexed in Science Citation Index-Expanded and Social Science Citation Index	PUB	20%
Per Capita Performance	Per capita academic performance of an institution	PCP	10%
Total			100%
*For institutions specialized in humanities and social sciences such as London School of Economics, N&S is not considered, and the weight of N&S is relocated to other indicators.			

Definition of Indicators

Alumni	The total number of the alumni of an institution winning Nobel Prizes and Fields Medals. Alumni are defined as those who obtain bachelor's, master's or doctoral degrees from the institution. Different weights are set according to the periods of obtaining degrees. The weight is 100% for alumni obtaining degrees after 2011, 90% for alumni obtaining degrees in 2001–2010, 80% for alumni obtaining degrees in 1991–2000, and so on, and finally 10% for alumni obtaining degrees in 1921–1930. If a person obtains more than one degrees from an institution, the institution is considered once only.
Award	The total number of the staff of an institution winning Nobel Prizes in Physics, Chemistry, Medicine and Economics and Fields Medal in Mathematics. Staff is defined as those who work at an institution at the time of winning the prize. Different weights are set according to the periods of winning the prizes. The weight is 100% for winners after 2011, 90% for winners in 2001–2010, 80% for winners in 1991–2000, 70% for winners in 1981–1990, and so on, and finally 10% for winners in 1921–1930. If a winner is affiliated with more than one institution, each

	institution is assigned the reciprocal of the number of institutions. For Nobel prizes, if a prize is shared by more than one person, weights are set for winners according to their proportion of the prize.
HiCi	The number of Highly Cited Researchers selected by Clarivate Analytics. The Highly Cited Researchers list issued in December 2018 (2018 HCR List as of December 6, 2018) was used for the calculation of HiCi indicator in ARWU 2019. Only the primary affiliations of Highly Cited Researchers are considered.
N&S	The number of papers published in *Nature* and *Science* between 2014 and 2018. To distinguish the order of author affiliation, a weight of 100% is assigned for corresponding author affiliation, 50% for first author affiliation (second author affiliation if the first author affiliation is the same as corresponding author affiliation), 25% for the next author affiliation, and 10% for other author affiliations. When there are more than one corresponding author addresses, we consider the first corresponding author address as the corresponding author address and consider other corresponding author addresses as first author address, second author address etc. following the order of the author addresses. Only publications of 'Article' type is considered.
PUB	Total number of papers indexed in Science Citation Index-Expanded and Social Science Citation Index in 2018. Only publications of 'Article' type is considered. When calculating the total number of papers of an institution, a special weight of two was introduced for papers indexed in Social Science Citation Index.
PCP	The weighted scores of the above five indicators divided by the number of full-time equivalent academic staff. If the number of academic staff for institutions of a country cannot be obtained, the weighted scores of the above five indicators is used. For ARWU 2019, the numbers of full-time equivalent academic staff are obtained for institutions in USA, UK, France, Canada, Japan, Italy, China, Australia, Netherlands, Sweden, Switzerland, Belgium, South Korea, Czech, Slovenia, New Zealand, etc.