Why do Universities Rankings have Such Different Lists?

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***Abstract*—University rankings feature lists of higher education institutions ranked by item and weight. As they are available in the internet, they can be consulted by anyone wishing to find the best universities: students who want to enter higher education, teachers and researchers looking for new positions and governments/investors who want to fund the best. The lists are easy to consult and available to everyone. There are different classifications which are published: some are global, some are subdivided by areas, and others are only for one country. The results are very different from each other because they follow different systems. Many of the rankings have a huge number of Asian (mainly Chinese) universities in top positions while others consist mostly of American universities. This article compares the lists of computer science universities that appear in the rankings and analyzes the criteria for creating each of these rankings. Our goal is to understand why there are so many differences and which rankings favor each type of investigation. There is a direct relationship between the massive presence of top Asian universities and the total dependence on WebOfScience publications. The same is not true when the data source is the Scopus database.**

***Index Terms*—University rankings, computer science, WebOfScience, Scopus.**

I. Introduction

University rankings feature lists of higher education institutions ranked by item and weight. As they are available in the internet, they can be consulted by anyone wishing to find the best universities: students who want to enter higher education, teachers and researchers looking for new positions and governments/investors who want to fund the best. The lists are easy to consult and available to everyone, becoming both popular with the public and increasingly important for academic institutions [1]. Being a popular means to compare institutions within a country and around the world, these rankings may influence assessments of institutional reputation, and this effect may be particularly strong when a new rankings system is introduced [2]. In fact, many may criticize rankings by saying they are not fair, for adopting items and weights that are not the right ones, or because higher education is not a football league that is shown on a team list [3]. The rankings are often heavily criticized: because of their statistical inaccuracy, because of the measures chosen to represent academic quality, or because of their expected negative impact on the overall performance of universities. But nobody wants to be left out of these lists and often are used as a marketing tool for universities to show their educational or research excellence [4].

There are different rankings which are published annually: some are global, some of these are subdivided by area, and others list institutions from only one country. There are other rankings which are well known and appreciated in the world, but were left out for having criteria that seemed to us to be less quantifiable. We left out other rankings that did not use areas, as in this case we intended the area of computer science. National rankings, such as the various lists published in the UK by national newspapers, are not used in this article because our goal will be to compare worldwide. Nowadays internationalization has made sense: globalization is part of the life of a citizen of the world. . Each system has its proper orientation or 'profile', and there is no 'perfect' system [5]. This article uses seven of the world's best known rankings, only in the context of computer science: Shanghai Ranking's Academic Rankings of World Universities (ARWU), CWTS Leiden Rankings (Leiden), Quacquarelli Symonds World University Rankings (QS), Times Higher Education World University Rankings (THE), the National Taiwan University Performance Ranking of Scientific Papers for World Universities (NTU Ranking), the USNews (USNews) Best Global Universities and University Ranking by Academic Performance (URAP).

Despite all the importance that indexs can have, the problem is that people who don't know how rankings are created are confused by so many disparities, leading even Pusser and Marginson to affirm that "rankings are poorly understood and that power has been neglected in models of postsecondary behavior" [6]. The comparison and analysis of national university ranking systems can help address a number of important policy questions [7]. By analyzing the results of these rankings, we find that they are very different: some have a large number of Asian (mainly Chinese) universities, while others are almost entirely American universities. The purpose of this article is primarily to see what the reasons for this are. Why does Tsinghua University from China top the Leiden, URAP, USNews, and NTU rankings but rank # 15 on the QS and THE systems? Or why is Massachusetts Institute of Technology from United States first in the rankings ARWU and QS but appears at number 24 in the Leiden system? When consulting each of these rankings, it

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appears that the position of each of the universities is very different, which shuffles who reads the different results. This article attempts to explain why, for each of the rankings, these results are so different and how these differences should be read.

The paper is organized with five sections: the background for analysis, Methodology and data, Results shows the main findings, Discussion results and Conclusions presents concluding remarks.

II. Background

U.S. News & World Report, a periodical in the United States, published the first ranking of universities in 1983 in order to meet a perceived market need for more transparent, comparative data about educational institutions [8]. Obviously the rankings were highly criticized, even for being created by those who are not from the "academy" and at the same time for using bibliometrics criteria. The rejection of bibliometric indicators on the part of the scientific community was supported by policy makers and government administrators, although mostly because of disinterest [9]. Van Ran even said that "Rankings such as the Shanghai one are part of a larger problem in the science evaluation circus" [10].

Despite all the criticisms, the world takes rankings into account. According to Billaut, et colleagues [11] a French Minister of Research and Higher Education was given by the French President the mission "to have two institutions among the world top 20 and ten among the world top 100". According to Dill and Soo [7], the government White Paper on higher education in the UK argued that market competition could be an important driver of academic quality, if appropriate university information can be provided to help inform student choice.

Criticisms have forced the creators of these tables to more exactingly specify their aims, improve their methodologies, consult with Advisory Boards, and increase the transparency of their undertakings. In addition, universities and governments have had to improve the quality and reliability of the higher education data they collect. By selecting a particular set of indicators and assigning each a given weight, the authors of these rankings are imposing a specific definition of quality on the institutions being ranked [8]. Quality is not a one-dimensional but rather a multidimensional concept: quality of teaching, quality of research, quality as a combination of activities, institutional mission, etc. [12]. One of the difficulties that arises with systems that attempt to rank universities according to their excellence is that genuine criteria of excellence can get confused with the mere symptoms of it [13]. The choice of weights is subjective and arbitrary, with little or no theoretical or empirical basis. as rankings proceed from the aggregation of information, their results can vary due to the chosen methodology and criteria [3]. The way which data from each of the systems is obtained can also lead to doubts. There are three ways to obtain the data: Survey data (opinions of stakeholders), Government agencies and University sources. Obviously, there are advantages and disadvantages to each of these three data sources. Other result to discuss is that the only indicators used by rankings are measures related to ISI databases [14], what causes problems as articles are not in English, areas that do not use the same databases [15] or the university size [16], for instance. And we have to think that there are areas within universities: on the one hand, students may have to apply to a discipline rather than to a university, and quality within a university may vary by discipline so averaging across departments can produce a distorted view of the university's quality [1].

The rankings have improved a lot in several aspects: are currently much more informative and user friendly [5]. What is important is how to read the lists, how they are created and what criteria and weights they use.

III. Methodology and Data

First of all we analysed the different world rankings best known internationally. From these we extracted only those who present their area of computer science globally. We then made a comparative analysis of the items and weights that each of these rankings use to rank universities. We listed the top 10 by university. We also made a comparison of some universities in the world and their position in each of the 7 rankings used. We find cases where there is a big difference in the positions of higher education institutions in relation to the rankings studied. In the end we make an analysis of these differences and seek to find the reasons for this.

Since there are several comparative studies of University Rankings [5], [17]-[19], we analysed 14 different world rankings best known internationally:

- ARWU, ShanghaiRanking's Academic Ranking of World Universities, www.shanghairanking.com
- CWUR, Center for World University Rankings, cwur.org
- Leiden, CWTS Leiden Ranking, www.leidenranking.com
- NTU, Performance Ranking of Scientific Papers for World Universities, National Taiwan University, nturanking.lis.ntu.edu.tw
- QS, Quacquarelli Symonds World University Rankings, www.topuniversities.com
- REUTERS, Reuters' ranking of the World's Most Innovative Universities, www.reuters.com/innovative-universities-2019
- RUR, Round University Ranking, roundranking.com
- SIR, Scimago Institutions Rankings, www.scimagoir.com
- THE, Times Higher Education World University Rankings, www.timeshighereducation.com
- U21, U21 Ranking of National Higher Education Systems, universitas21.com/rankings
- U-Multirank, U-Multirank ranking, www.umultirank.org
- URAP, University Ranking by Academic Performance, www.urapcenter.org

- USNews,Best Global Universities da USNews, www.usnews.com/education/best-global-universities
- Webometrics, Ranking of World Universities, www.webometrics.info

For our study we used seven: ARWU, Leiden, NTU, QS, THE, URAP and USNews. Exclusion criteria were: No Computer Science sub-area (CWUR, REUTERS, RUR, SIR, U21, and Webometric) and avoid rankings with weights and criteria established by each site user (U-Multirank).

Each of the rankings has different indicators and weights. It is very important to know which database is used: there are cases where WebOfScience is used, other rankings use Scopus:

ARWU [20] Wos
- Quality of education Alumni of an institution winning Nobel Prizes and Fields Medals (10%)
- Quality of faculty (40%)
- Staff of an institution winning Nobel Prizes and Fields Medals (20%)
- Highly cited researchers in 21 broad subject categories (20%)
- Research output (40%)
- Articles published in Nature and Science (20%)
- Articles in Science Citation Index-expanded, and Social Science Citation Index (20%)
- Per capita academic performance of an institution performance (10%)

Leiden [21] Wos
- size-dependent
- size-independent variant

NTU [22] Wos
- Research productivity (25%)
- Number of articles in the last 11 years* (2008-2018) (10%)
- Number of articles in the current year (2018) (15%)
- Research impact (35%)
- Number of citations in the last 11 years* (2008-2018) (15%)
- Number of citations in the last 2 years (2017-2018) (10%)
- Average number of citations in the last 11 years* (2008-2018) (10%)
- Research Excellence (40%)
- H-index of the last 2 years (2017-2018) (10%)
- Number of Highly Cited Papers* (2008-2018) (15%)
- Number of articles in the current year in high-impact journals (2017-2018) (15%)

QS [23] Scopus
- Academic Reputation (40%)
- Employer Reputation (10%)
- Faculty/Student Ratio (20%)
- Citations per faculty (20%)
- International Faculty Ratio (5%)
- International Student Ratio (5%).

THE [24] Scopus
- Teaching (the learning environment) (30%)
  - Reputation survey: 15%,
  - Staff-to-student ratio: 4.5%,
  - Doctorate-to-bachelor's ratio: 2.25%,
  - Doctorates-awarded-to-academic-staff ratio: 6%,
  - Institutional income: 2.25%
- Research (volume, income and reputation) (30%)
  - Reputation survey: 18%,
  - Research income: 6%,
  - Research productivity: 6%
- Citations (research influence) (30%)
- International outlook (staff, students, research) (7.5%)
  - Proportion of international students: 2.5%,
  - Proportion of international staff: 2.5%,
  - International collaboration: 2.5%
- Industry income (knowledge transfer) (2.5%)

URAP [25] Wos
- Article (21%)
- Total Document (10%)
- Citation (21%)
- Article Impact Total (18%)
- Citation Impact Total (15%)
- International Collaboration (15%).

USNews [26] Wos
- Global research reputation (12.5%)
- Regional research reputation (12.5%)
- Publications (10%)
- Books (2.5%)
- Conferences (2.5%)
- Normalized citation impact (10%)
- Total citations (7.5%)
- Number of publications that are among the 10% most cited (12.5%)
- Percentage of total publications that are among the 10% most cited (10%)
- International collaboration – relative to country (5%)
- International collaboration (5%)
- Number of highly cited papers that are among the top 1% most cited in their respective field (5%)
- Percentage of total publications that are among the top 1% most highly cited papers (5%).

IV. Results

Universities have different positions in the 7 rankings. In the following Table I we list the universities that are in the top ten places in each of the 7 rankings.

TABLE I. TOP 10 Universities in Global Rankings, Subarea CS.

ARWU 2019 CS & Engineering	QS 2019 CS & Information Systems
1. MIT (USA) 2. Stanford University (USA) 3. UCLA, Berkeley (USA) 4. Carnegie Mellon U (USA) 5. Swiss FedIT Zurich (Swit.) 6. Harvard University (USA) 7. Tsinghua University (China) 8. UCLA, Los Angeles (USA) 9. Princeton University (USA) 10. University of Oxford (UK)	1. MIT (USA) 2. Stanford University (USA) 3. Carnegie Mellon U(USA) 4. UCLA, Berkeley (USA) 5. University Cambridge (UK) 6. University Oxford (UK) 7. Harvard University (USA) 8. EP Lausanne (Switzerland) 9. ETH Zurich (Switzerland) 10. Natl U Singapore (Sing.)
THE 2020 CS	USNews 2020 CS
1. University Oxford (UK) 2. Stanford University (USA) 3. ETH Zurich (Switzerland) 4. MIT (USA) 5. University Cambridge (UK) 6. Carnegie Mellon Uy (USA) 7. Imperial Coll London (UK) 8. Harvard University (USA) 9. Princeton University (USA) 10. California IT (USA)	1. Tsinghua University (China) 2. Nanyang Tec U (Sing.) 3. King Abdulaziz U (Saudi) 4. Natl U Singapore (Sing.) 5. U Texas--Austin (USA) 6. Southeast Univ (China) 7. Shanghai Jiao Tong (China) 8. Huazhong U ST (China) 9. Stanford University (USA) 10. MIT (USA)
NTU 2019 CS	URAP 2018-2019 Information & CS
1. Tsinghua University (China) 2. Nanyang Tec U (Singapore) 3. Harbin IT (China) 4. Xidian University (China) 5. Huazhong U of ST (China) 6. Shanghai Jiao Tong U (China) 7. Southeast University (China) 8. City U of Hong Kong (HK) 9. University EST China (China) 10. Zhejiang University (China)	1. Tsinghua University (China) 2. Nanyang Tecl U (Sing.) 3. Natl U Singapore (Sing.) 4. Shanghai Jiao Tong (China) 5. Xidian University (China) 6. Southeast U China (China) 7. ETH Zurich (Switzerland)) 8. Huazhong U ST (China) 9. MIT (USA) 10. Stanford University (USA)

Leiden
2019
Mathematics and CS
1. Tsinghua University (China)
2. Xidian University (China)
3. University EST China (China)
4. Harbin Inst Technol (China)
5. Zhejiang University (China)
6. Beihang University (China)
7. Shanghai Jiao Tong U (China)
8. Huazhong U ST (China)
9. Southeast University (China)
10. Beijing Posts &Tel. (China)

The following Table II lists system the percentage of presence in the top 10 by continent and ranking system.

There are rankings whose top10 is completely made up of Asian universities (Leiden and NTU), however there are lists that do not feature any top10 Asian university (THE) or just have one top10 Asian university (ARWU and QS). There are rankings (top 10) that list mostly American universities (ARWU 70%, THE 60%). The top 10 which feature a total of universities from the Asian continent do not list any European universities. It can be seen that there aren't any universities from Oceania, Africa or Latin America in the top 10.

TABLE II. TOP 10 BY CONTINENT IN GLOBAL RANKINGS, SUBAREA CS

	ARWU	Leiden	NTU	QS	THE	URAP	USN
Asia	10%	100%	100%	10%		70%	70%
Europe	20%			40%	40%	10%	
North	70%			50%	60%	20%	30%

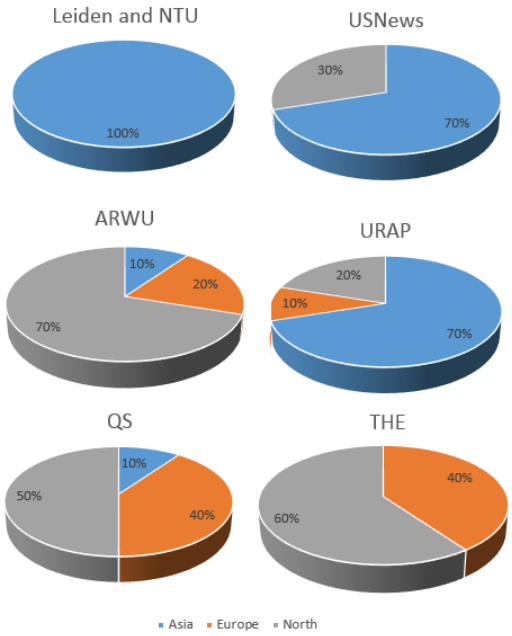

Figure 1. Top10 by ranking system and continent.

In the Fig. 1 we present by ranking system the percentage of each continent in the constitution of its top 10 universities in the world in the sub-area of computer science. This way it is visually easier to see the differences: the first three rankings (we grouped Leiden and NTU because they both have 100% Asian universities) and the last chart that only has universities in North America and Europe.

V. DISCUSSION RESULTS

Thus each of the universities has a very different place in each of the rankings. In the following Table III we list the places of five universities. For example, Tsinghua University of China is in 1st place in Leiden, NTU, URAP and USNews, but "only" in 7th in ARWU and 15th in QS and THE.

The Table IV and Fig. 2 shows the relationship between the dependence on the publications criterion and the percentage of Asian and United States universities in the top 10, considering source as WebOfScience: the higher the first, the higher the latter. The cases of the Leiden and NTU systems are pragmatic: the weight of WoS publications is 100%, so there are 100% Asian universities in the top 10. URAP features 70% top Asian universities despite 100% dependence on Wos publications. The reason may be the years to which the data relate: in the case of URAP 21% refers to 2017 and 79% to the years 2013-2017. In the case of Leiden the publications refer to the years 2014–2017. In the case of NTU, 50% refers to 2008-2018, 35% to 2017-2018 and 15% to 2018.

TABLE III. EXAMPLE OF POSITION OF SOME UNIVERSITIES IN EACH OF THE 7 RANKING.

	ARWU	Leiden	QS	THE	NTU	URAP	USN
Tsinghua	7	1	15	15	1	1	1
Nanyang	13	13	12	13	2	2	2
MIT	1	24	1	4	19	9	10
Natl U Singapore	16	23	10	11	13	3	4
Stanford	2	54	2	2	21	10	9
ETH Zurich	5	46	9	3	26	7	12
Shanghai Jiao Tong	27	7	38	45	7	4	7
Carnegie Mellon	4	73	3	6	29	15	18
Zhejiang	31	5	51-100	41	10	12	11
Texas Austin	11	50	29	25	74	19	5
Oxford	10	59	6	1	73	39	84
Cambridge	27	92	5	5	76	55	66
Harbin Itec	35	4	151-200	126–150	3	13	21
King Abdulaziz	51-75	47	151-200	126–150	15	17	3
Huazhong UST	39	8	151-200	176–200	5	8	8
Xidian	51-75	2	401-450	251–300	4	5	22
UST of China	48	3	401-450	301–400	24	24	34

TABLE IV. SOURCE, WEIGHT OF PUBLICATIONS AND PERCENTAGE OF ASIAN AND USA UNIVERSITIES IN THE TOP 10

Rank	Source	Weights	Asia	USA
Leiden	Wos	100%	100%	0%
NTU	Wos	100%	100%	0%
URAP	Wos	100%	70%	10%
ARWU	Wos	30%	10%	70%
USNews	Wos	25%	70%	30%
QS	Scopus	20%	10%	50%
THE	Scopus	60%	0%	60%

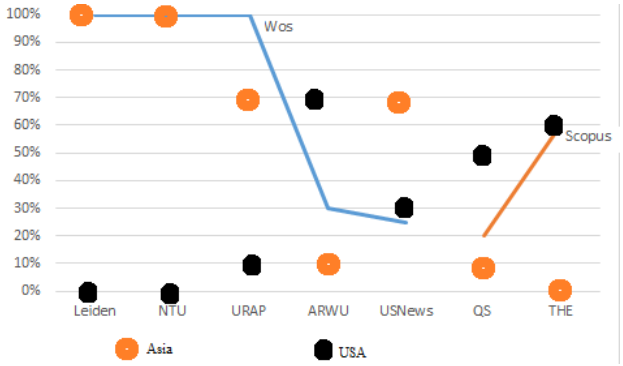

Figure 2. Source, weight of publications and percentage of asian and usa universities in the top 10 by system ranking.

VI. Conclusion

This article was written to try to understand why there are so many differences in different university rankings. We started by studying the rankings that exist and then extracted seven. These seven were chosen because they have the computer sciences subarea and are not a ranking that each user can parameterize. The seven chosen were Shanghai Ranking of Academic Rankings of World Universities (ARWU), CWTS Leiden Rankings (Leiden), Quacquarelli Symonds World University Rankings (QS), Higher Education World Rankings University (THE), the National Taiwan University Performance Ranking of Scientific Papers for World Universities (NTU Ranking), the USNews (USNews) Best Global Universities and University Ranking by Academic Performance (URAP). We studied the criteria and weights used by each of the systems to find the ordered list. Finally we listed the top 10 of each of the seven universities, the percentage of each continent in the top 10 and some well-known universities and their position in each of the rankings.

We find that when there is a heavy reliance on the WoS database, the top 10 tend to be Asian universities. The same is not true when the dependence (even small) on the Scopus database. In a next study we will try to see how the ranking is constituted if we use both databases and eventually another that was not used for any of these seven chosen rankings.

In this article it is possible to understand why the rankings of universities give such different results. To understand the systems, it is necessary to be aware of the criteria and weights that each one uses. We were also able to demonstrate the importance of the bibliometric database that is used makes the results extremely different. In this case, we were even able to demonstrate that the differences appear in relation to country positions in global terms in the rankings of universities.

Conflict of Interest

The authors declare no conflict of interest

Author Contributions

The author did a literature review, defined the methodology, research and data treatment, data analysis and conclusions, having written the entire document.

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