BRIEF COMMUNICATION

# Which of the World's Institutions Employ the Most Highly Cited Researchers? An Analysis of the Data From highlycited.com

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**In 2014, Thomson Reuters published a list of the most highly cited researchers worldwide (highlycited.com). Because the data are freely available for downloading and include the names of the researchers' institutions, we produced a ranking of the institutions on the basis of the number of highly cited researchers per institution. This ranking is intended to be a helpful amendment of other available institutional rankings.**

In 2014, Thomson Reuters published a list of the most highly cited researchers worldwide (highlycited.com). This list was also published in a report (Thomson Reuters, 2014), and the data can be downloaded as an Excel file for further statistical analyses. Myklebust (2014), for example, used the data to undertake a breakdown by country of the distribution of the researchers.

To identify highly cited researchers, Thomson Reuters (provider of the Web of Science) selected, as a first step, publications from the natural and social sciences with document type "article" and "review" and publication years between 2002 and 2012. Then, they determined those publications that belonged to the top 1% by citations in their subject area and publication year. In the second step, the authors of these highly cited publications were sorted by the discipline (e.g., Materials Science; see http://in-cites.com/thresholds-citation.html).[1] In step 3 a ranking was set up within a discipline: The more highly cited publications there were for a researcher, the higher his or her rank in the discipline. In the list of the most highly cited researchers published in the URL above and the report mentioned above, those researchers are listed whose rank is less than or equal to the square root of the population consisting of all researchers in a discipline with at least one highly cited publication. A total of 3,215 researchers appear in the list of highly cited researchers. These are 3,215 rows representing appearances of researchers and their institutions because of selection in one or more disciplines. Apparently, the actual number of unique researchers is 3,073.

In this study, we investigate the global distribution of highly cited researchers across institutions. For this evaluation, an elaborate cleaning process was necessary because many institutions were not consistently named by their authors, but had several variants. In this cleaning process, we also combined all individual institutions of an organization—insofar as they could be recognized. Thus, for example, we combined all individual universities of the University of California system and all Max Planck institutes of the Max Planck Society. Unfortunately, some of the institutions named by the researchers could not be processed by us

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[1]Disciplines are sets of journals in which the highly cited publications appeared.

because the data were too unspecific (e.g., USA) or ambiguous (an abbreviation can stand for more than one institution, even within a country).

Many highly cited researchers mentioned not just one, but up to five different institutions. For this reason, we produced three ranking lists, which include these institutions in different ways. The first ranked list of institutions (see Table 1) is based on the first-named institution for each researcher (his or her primary institution). Using primary institutions, the largest number of highly cited researchers work at the University of California ($n = 179$) followed by Harvard University ($n = 107$).

The second ranked list of institutions (see Table 2) is based on all the institutions named by a highly cited researcher. This leads to an interesting change in the ranking list. Compared with Table 1, the ranking order of the institutions hardly changes in the higher positions; but now King Abdulaziz University appears in second place. Apparently, a great number of researchers mention this institution as an additional institution in addition to their primary one.

As Bhattacharjee (2011) reported some years ago in *Science*, Saudi Arabian universities offer highly cited researchers contracts in which the researchers commit themselves to listing the Saudi Arabian university as an additional institution in publications (or on highlycited.com). In return, the researchers receive an adjunct professorship, which is connected with an attractive salary and a presence at the university of only 1 or 2 weeks per year (for teaching duties on-site). Gingras (2014a) calls these "dummy affiliations, with no real impact on teaching and research in universities, [which] allow marginal institutions to boost their position in the rankings of universities without having to develop any real scientific activities." Another analysis of data from highlycited.com by Alanazi (2014) shows that especially King Abdulaziz University among the Saudi Arabian universities pursues the policy of contracting with highly cited researchers.

As our analyses of the data from Thomson Reuters show, many highly cited researchers listed only one institution, but others two or more (up to five). These institutions can either be counted as units (as in Table 2) or as fractions. In the fractionated method, the number of institutions listed by a researcher is taken into account: If he or she has listed three institutions, for instance, each institution is counted as 1/3. The result of the fractionated method for the number of highly cited researchers per institution is given in Table 3. As expected, the number of highly cited researchers at King Abdulaziz University is significantly reduced (from 160 to approximately 80).

Comparing Tables 1 to 3, it is interesting to see that the first six positions—with the notable exception of King Abdulaziz University—are the same in the three rankings, whereas the lower ones are scrambled. That is because the differences between the institutions are generally larger at the beginning and smaller at the end. It is clearly visible in all three tables that the differences in the number of highly cited researchers are relatively large for institutions in the first six positions. This leads to robust findings, although different counting methods are used in the three tables. Because the differences in the number of highly cited researchers at the lower positions are relatively small, the different counting methods lead to different institutional positions.

The evaluation of the list of highly cited researchers on the basis of institutions is an interesting alternative to the

TABLE 1. Numbers of highly cited researchers per institution, determined by their primary institution. The 20 institutions with the highest number of highly cited researchers are shown.

| Rank | Primary institution of a researcher | Number |
|---|---|---|
| 1 | University of California, USA | 179 |
| 2 | Harvard University, USA | 107 |
| 3 | National Institutes of Health (NIH), USA | 91 |
| 4 | Stanford University, USA | 56 |
| 5 | Max Planck Society, Germany | 52 |
| 6 | Chinese Academy of Sciences, China | 46 |
| 7 | University of Texas, USA | 43 |
| 8 | University of Oxford, UK | 33 |
| 9 | Duke University, USA | 32 |
| 9 | Massachusetts Institute of Technology (MIT), USA | 32 |
| 11 | University of Michigan, USA | 31 |
| 12 | University of London, UK | 30 |
| 12 | Wellcome Trust Sanger Institute, UK | 30 |
| 14 | Broad Institute, USA | 28 |
| 14 | EMBL, UK–Germany | 28 |
| 14 | Northwestern University, USA | 28 |
| 17 | Princeton University, USA | 27 |
| 17 | University of Washington, USA | 27 |
| 19 | Brigham & Women's Hospital, USA | 26 |
| 19 | Johns Hopkins University, USA | 26 |

TABLE 2. Numbers of highly cited researchers per institution taking into account all the institutions mentioned by a researcher. The 20 institutions with the highest numbers of highly cited researchers are shown.

| Rank | All of a researcher's named institutions | Number |
|---|---|---|
| 1 | University of California, USA | 198 |
| 2 | King Abdulaziz University, Saudi Arabia | 160 |
| 3 | Harvard University, USA | 146 |
| 4 | National Institutes of Health (NIH), USA | 97 |
| 5 | Stanford University, USA | 60 |
| 6 | Max Planck Society, Germany | 57 |
| 7 | Chinese Academy of Sciences, China | 48 |
| 8 | Massachusetts Institute of Technology (MIT), USA | 44 |
| 8 | University of Texas, USA | 44 |
| 10 | University of Oxford, UK | 37 |
| 11 | University of London, UK | 35 |
| 11 | Wellcome Trust Sanger Institute, UK | 35 |
| 13 | Broad Institute, USA | 34 |
| 14 | Duke University, USA | 32 |
| 14 | University of Michigan, USA | 32 |
| 16 | EMBL, UK–Germany | 31 |
| 16 | University of Washington, USA | 31 |
| 18 | Johns Hopkins University, USA | 30 |
| 18 | Northwestern University, USA | 30 |
| 20 | Princeton University, USA | 29 |


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TABLE 3. Numbers of highly cited researchers per institution using the fractionated method. The 20 institutions with the highest numbers of highly cited researchers are shown.

| Rank | All of a researcher's named institutions | Number |
|---|---|---|
| 1 | University of California, USA | 178.00 |
| 2 | Harvard University, USA | 110.50 |
| 3 | National Institutes of Health (NIH), USA | 93.00 |
| 4 | King Abdulaziz University, Saudi Arabia | 80.28 |
| 5 | Stanford University, USA | 55.50 |
| 6 | Max Planck Society, Germany | 49.50 |
| 7 | Chinese Academy of Sciences, China | 41.33 |
| 8 | University of Texas, USA | 39.50 |
| 9 | Massachusetts Institute of Technology (MIT), USA | 33.08 |
| 10 | University of Oxford, UK | 32.08 |
| 11 | Wellcome Trust Sanger Institute, UK | 31.33 |
| 12 | University of Michigan, USA | 30.83 |
| 13 | Duke University, USA | 29.50 |
| 14 | University of London, UK | 29.33 |
| 15 | University of Washington, USA | 29.00 |
| 16 | Princeton University, USA | 27.33 |
| 17 | EMBL, UK–Germany | 27.17 |
| 18 | Northwestern University, USA | 26.50 |
| 19 | Johns Hopkins University, USA | 26.25 |
| 20 | University of Cambridge, UK | 23.67 |

usual university rankings (e.g., such as the Leiden Ranking, leidenranking.com). Because scientific work is performed by individuals and the attribution of success is generally applied at the level of the individual (as with the Nobel Prize; Ziman, 2000), counting the number of successful people seems more reasonable than counting the number of successful publications (as with the Leiden Ranking's number of highly cited publications per institution). To be highly cited as a scientist means to be well known, and that made citation indices so attractive and important, for scientists and bibliometricians. However, it does not mean that only highly cited authors have produced high-quality research. For example, it was found by Garfield (2006) that Nobel Prize winners are often highly cited, but, far from all highly cited authors are Nobel Prize winners.

The results for King Abdulaziz University illustrate that university rankings can be manipulated. In a similar analysis of the highly cited researchers data set, Gingras (2014b) concluded: "All these data certainly suggest that this particular institution has found a cheap way to be considered 'excellent' in world university rankings." The results of Alanazi (2014) suggest a similar conclusion.

A manipulation of the list of highly cited researchers also has consequences for the Academic Ranking of World Universities (ARWU; http://www.shanghairanking.com/)—the oldest and best-known international university ranking (Hazelkorn, 2011). ARWU considers data from highlycited.com to rank universities according to their number of highly cited researchers in 21 subject categories. "These individuals are the most cited within each category. If a Highly Cited Researcher has two or more affiliations, he/she was asked to estimate his/her weights (or number of weeks) for each affiliation. More than 2/3 of those multi-affiliated Highly Cited Researchers provided such estimations and their affiliations receive the weights accordingly. For those who did not answer, their first affiliation is given a weight of 84% (average weight of the first affiliations for those who replied) and the rest affiliations share the remaining 16% equally" (http://www.shanghairanking.com/ARWU-Methodology-2013.html).

To counteract attempts at manipulation, ARWU should consider only the primary institutions of highly cited researchers.

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