

That's the way to do it How the rankings are created



Teaching
(The learning environment)

30%

The World University Rankings provide the most accurate system of analysis available to delineate the finest universities. Here we present a closer look at the methodology

The *Times Higher Education* World University Rankings are the only global university performance tables to judge research-led universities across all their core missions – teaching, research, knowledge transfer and international outlook. We employ 13 carefully calibrated performance indicators to provide the most comprehensive and balanced comparisons, which are trusted by students, academics, university leaders, industry, even governments. The methodology for the 2013-14 World University Rankings is identical to that used since the 2011-12 tables, offering a year-on-year comparison based on true performance rather than methodological change.

Our 13 performance indicators are grouped into five areas: **TEACHING** (the learning environment); **RESEARCH** (volume, income and reputation); **CITATIONS** (research influence); **INTERNATIONAL OUTLOOK** (staff, students and research); and **INDUSTRY INCOME** (innovation).

Exclusions

Universities are excluded from the *Times Higher Education* World University Rankings if they do not teach undergraduates, if they teach only a single narrow subject, or if their research output amounted to fewer than 1,000 articles between 2007 and 2011 (200 a year) (see page 50). In exceptional cases, institutions below the 200-paper threshold are included if they have a particular focus on disciplines with generally low publication volumes, such as engineering or the arts. Further exceptions to the threshold are made for the six specialist subject tables (see pages 52 to 64).

Scores

To calculate the overall rankings, “Z-scores” were created for all datasets except for the results of the academic reputation survey. The calculation of Z-scores standardises the different data types on a common scale and allows fair comparisons between different types of data – essential when combining diverse information into a single ranking. Each data point is given a score based on its distance from the mean average of the entire dataset, where the scale is the standard deviation of the dataset.

The Z-score is then turned into a “cumulative probability score” to arrive at the final totals. If University X has a cumulative probability score of 98, for example, then a random institution from the same data distribution will fall below the institution 98 per cent of the time. For the results of the reputation survey, the data are highly skewed in favour of a small number of institutions at the top of the rankings, so in 2011-12 we added an exponential component to increase differentiation between institutions lower down the scale, a method we have retained.

Data collection

Institutions provide and sign off their institutional data for use in the rankings. On the rare occasions when a particular data point is missing – which affects only low-weighted indicators such as industrial income – we enter a low estimate between the average value of the indicators and the lowest value reported: the 25th percentile of the other indicators. By doing this, we avoid penalising an institution too harshly with a “zero” value for data that it overlooks or does not provide, but we do not reward it for withholding them.

Reputation survey
15%

Thomson Reuters carried out its latest reputation survey in spring 2013. It examined the perceived prestige of institutions in research and teaching. The responses were statistically representative of global higher education's geographical and subject mix.

Staff-to-student ratio
4.5%

Doctorate-to-bachelor's ratio
2.25%

**Doctorates awarded
to academic staff ratio**
6%

As well as giving a sense of how committed an institution is to nurturing the next generation of academics, a high proportion of postgraduate research students also suggests the provision of teaching at the highest level that is thus attractive to graduates and effective at developing them. This indicator is normalised to take account of a university's unique subject mix, reflecting that the volume of doctoral awards varies by discipline.

Institutional income
2.25%

This measure of income is scaled against staff numbers and normalised for purchasing-power parity. It indicates an institution's general status and gives a broad sense of the infrastructure and facilities available to students and staff.

Research (Volume, income and reputation)

30%

Citations (Research influence)

30%

International outlook (Staff, students and research)

7.5%

Industry income (Innovation)

2.5%

Reputation survey 18%

The most prominent indicator in this category looks at a university's reputation for research excellence among its peers, based on the responses to our annual academic reputation survey.

Research income 6%

Research income is scaled against staff numbers and normalised for purchasing-power parity. This is a controversial indicator because it can be influenced by national policy and economic circumstances. But income is crucial to the development of world-class research, and because much of it is subject to competition and judged by peer review, our experts suggested that it was a valid measure. This indicator is fully normalised to take account of each university's distinct subject profile, reflecting the fact that research grants in science subjects are often bigger than those awarded for the highest-quality social science, arts and humanities research.

Research productivity 6%

We count the number of papers published in the academic journals indexed by Thomson Reuters per academic, scaled for a university's total size and also normalised for subject. This gives an idea of an institution's ability to get papers published in quality peer-reviewed journals.

Our research influence indicator is the flagship, the single most influential of the 13 indicators. It looks at the role of universities in spreading new knowledge and ideas.

We examine research influence by capturing the number of times a university's published work is cited by scholars globally. This year, our data supplier Thomson Reuters examined more than 50 million citations to 6 million journal articles, published over five years. The data are drawn from the 12,000 academic journals indexed by Thomson Reuters' Web of Science database and include all indexed journals published between 2007 and 2011. Citations to these papers made in the six years from 2007 to 2012 are also collected.

The citations help to show us how much each university is contributing to the sum of human knowledge: they tell us whose research has stood out, has been picked up and built on by other scholars and, most importantly, has been shared around the global scholarly community to expand the boundaries of our collective understanding, irrespective of discipline. The data are fully normalised to reflect variations in citation volume between different subject areas. This means that institutions with high levels of research activity in subjects with traditionally high citation counts do not gain an unfair advantage.

We exclude from the rankings any institution that publishes fewer than 200 papers a year to ensure that we have enough data to make statistically valid comparisons.

International to domestic student ratio 2.5%

The ability of a university to attract undergraduates and postgraduates from all over the planet is key to its success on the world stage.

International to domestic staff ratio 2.5%

Research 2.5%

In the third international indicator, we calculate the proportion of a university's total research journal publications that have at least one international co-author and reward higher volumes.

This indicator is normalised to account for a university's subject mix and uses the same five-year window as the "Citations: research influence" category.

A university's ability to help industry with innovations, inventions and consultancy has become a core mission of the contemporary global academy. This category seeks to capture such knowledge transfer activity by looking at how much research income an institution earns from industry, scaled against the number of academic staff it employs.

The category suggests the extent to which businesses are willing to pay for research and a university's ability to attract funding in the commercial marketplace – useful indicators of institutional quality.



Squadron supreme

Our subject tables are dominated by the same elite players jockeying for position, explains Phil Baty

The California Institute of Technology may have held on to the top spot in the rankings for the third consecutive year, but in our subject tables it is not so simple.

In something of a merry-go-round, the same players dominate the top of the tables just as they did last year, but in a different order. In three, the summit has a new occupant: Harvard University has taken the crown for life sciences from the Massachusetts Institute of Technology; MIT, meanwhile, has displaced Caltech as the world's best engineering and technology institution; while Stanford University has stolen MIT's number one spot in social sciences.

Stanford has held on to its top rank in the arts and humanities, making it the only institution to lead more than one subject table. Caltech has maintained its number one position in the physical sciences, while the University of Oxford still leads clinical, pre-clinical and health.

On the following pages we reveal the top 50 in each of the six subject fields. To see the top 100 figures, visit www.timeshighereducation.co.uk/world-university-rankings

DIFFERENT WEIGHTS AND MEASURES

The subject tables employ the same range of 13 performance indicators used in the overall World University Rankings (page 30), brought together with scores provided under five categories:

- **Teaching:** the learning environment
- **Research:** volume, income and reputation
- **Citations:** research influence
- **International outlook:** staff, students and research
- **Industry income:** innovation.

Here, the overall methodology is carefully recalibrated for each subject, with the weightings changed to best suit the individual fields. In particular, those given to the research indicators have been altered to fit more closely the research culture in each subject, reflecting different publication habits: in the arts and humanities, for instance, where the range of outputs extends well beyond peer-reviewed journals, we give less weight to paper citations.

Accordingly, the weight given to "citations: research influence" is halved from 30 per cent in the overall rankings to just 15 per cent for the arts and humanities.

More weight is given to other research indicators, including the academic reputation survey.

For social sciences, where there is also less faith in the strength of citations alone as an indicator of research excellence, the measure's weighting is reduced to 25 per cent.

By the same token, in those subjects where the vast majority of research outputs come through journal articles and where there are high levels of confidence in the strength of citations data, we have increased the weighting given to the research influence (up to 35 per cent for the physical and life sciences and for the clinical, pre-clinical and health tables).

A breakdown of the methodology for each subject is provided at the foot of the tables.

CRITERIA

No institution can be included in the overall World University Rankings unless it has published a minimum of 200 research papers a year over the five years we examine.

But for the six subject tables, the threshold drops to 100 papers a year for subjects that generate a high volume of publications and 50 a year in subjects such as social sciences where the volume tends to be lower.

Although we apply some editorial discretion, we generally expect an institution to have at least 10 per cent of its staff working in the relevant discipline in order to include it in the subject table.

The majority of institutions in Thomson Reuters' Global Institutional Profiles database, which fuels the rankings, provide detailed subject-level information. In rare cases where such data are not supplied, institutions are either excluded or public sources are used to inform estimates.