Interdisciplinary Science Rankings
Preliminary analysis from THE

In association with SCHMIDT SCIENCE FELLOWS
This report reflects on the activities up to date to create systems of data collection and analysis that could effectively capture institutions’ progress in Interdisciplinary Science Ranking (ISR), benchmarked worldwide. The report explains the findings of the initial feasibility study, the creation of the metric pillars and metrics, the data collection process, and an analysis of the initial findings of that process at both country and institutional level.

Overall, with nearly 1200 institutions participating, there is an evident desire of institutions to understand how their activity and output on interdisciplinary research can be measured. University leaders and academic confirmed that metrics can effectively act as performance indicators, driving forward standards, and incentivising change for research cultures in institutions towards greater collaboration and interdisciplinarity.

The report shows how three areas are key to understanding the progress being made by institutions on interdisciplinary research. Firstly, the inputs into interdisciplinarity, including dedicated funding and jobs. Secondly, the internal processes and structures that support and incentivise interdisciplinarity, including physical space, administrative support and rewards. Finally, the outputs of interdisciplinary research, as measured by a variety of bibliometrics and global reputation.

In these areas, the analysis of data shows that there is greater focus on the inputs and processes in universities from the Global South, whereas universities in the Global North perform well on output measurements related to research quality, volume and reputation. However, overall participation is strongly rooted in the Global South, demonstrating a keen focus on interdisciplinarity as a priority for solving problems that are specific to those regions.
Interdisciplinary science is regarded as vital for addressing the world’s contemporary challenges. Whilst the pursuit of interdisciplinary science is far from new, it has become increasingly central to both academic interest and government science policies (Davé et al., 2016). There are a number of drivers for this, including: an increased appreciation of the inherent complexity of nature and society; an increased desire to explore problems and questions which are not confined to a single discipline; the need to solve grand societal challenges; and to fully exploit the power of new technologies (National Academy of Sciences et al., 2005).

The pursuit of interdisciplinary science nevertheless has its own obstacles. Individual disciplines tend to have defined research practices, languages, philosophies, and communities which may often seem incompatible. Given these challenges there is scope for developing the incentives for universities to support and pursue interdisciplinary science research. A ranking that captures measurable indicators of the maturity and progress being made in interdisciplinary science can provide transparent benchmarks to develop those very incentives.

Times Higher Education (THE) is a leader in developing university rankings and performance metrics. THE’s World University Rankings are a robust ranking of the world’s research-intensive universities and have acted as a stimulus for change in higher education policy (Hazelkorn & Ryan, 2013). The development of THE’s Impact Rankings, which measure universities’ contributions toward achieving the UN’s Sustainable Development Goals (SDGs), have brought to the fore the vital role universities play in sustainable development. Other bespoke rankings, including the Sub-Saharan African Rankings, are designed with metrics specifically to meet the needs and aspirations of universities in that region.

THE consultants and data scientists have worked closely with university leaders and academics to ensure the interests of the sector are represented in rankings, and have created advisory boards to ensure that there is continuous feedback and buy-in. Overall, THE rankings can support positive change in research; the creation of an interdisciplinary science rankings (ISR) can likewise highlight key areas of improvement across interdisciplinary research, investment and funding and career development.
2.1 Research and Feasibility Study

Undertaken between April and June 2022, THE consultants produced a feasibility study for SSF through research and consultation with the global higher education sector.

Five roundtables were held with leading academics and senior university staff to gain their insight into what kind of measures and metrics could capture the progress made by universities in interdisciplinary science. Two roundtables included a mix of global leaders, and three were geography specific.

Global Roundtable
Hosted At: THE’s Innovation and Impact Summit
In: April 2022

European Roundtable
Hosted At: THE’s European University Summit
In: May 2022

Asian Roundtable
Hosted At: THE’s Asia Universities Summit
In: May 2022

North American Roundtable
Held In: Parallel to the SSF Global Meeting
In: June 2022

Virtual Global Roundtable
Hosted By: THE
In: June 2022

A total of 34 university leaders and subject matter experts participated in the roundtable discussions, supplemented with three one-to-one discussions. The outcomes of the roundtables and discussions can be summarised under the following five areas.

1. A positive sentiment towards creating the interdisciplinary science ranking
   • Roundtable participants all agreed that collaboration across different disciplines was vital to solve global societal challenges.
   • There was a belief that metrics used to underpin rankings can show value of the overall contribution of interdisciplinary science research to education overall.
   • Understanding that rankings can be an effective driver of behaviour and attitude for academic institutions and other parties including policymakers.

2. Definitions of interdisciplinary research
   • Interdisciplinary research can refer to where experts from distinct disciplines come together to research and solve a problem.
   • It can also increasingly refer to single individuals that work across different disciplines, developing new mindsets through constant multi-disciplinary engagement.
   • There was debate as to whether interdisciplinary research could be measured if only focusing on STEM subjects. The example of COVID-19 was highlighted to show how other non-science disciplines such as social sciences, business and law were also needed to provide a global solution.

3. Key methods that can lead to producing more interdisciplinary science research
   • Funding is a big incentive for conducting interdisciplinary research.
   • Creating interdisciplinary space (physical and virtual) with the purpose of bringing faculty from across disciplines together into one space to facilitate collaboration.
   • Recruiting skilled staff specifically for interdisciplinary research.
Based on the findings of the roundtables, and THE’s own history and experience in developing rankings, it was determined that to best capture and measure interdisciplinary research, a framework of measurement should include the following metric pillars: inputs, processes, and outputs. The following Figure 1 shows the 12 metrics selected for the ISR under each metric pillar.

**Figure 1** Metrics Selected for ISR Under Three Metric Pillars

<table>
<thead>
<tr>
<th>METRIC PILLARS</th>
<th>INPUTS</th>
<th>PROCESSES</th>
<th>OUTPUTS</th>
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<tbody>
<tr>
<td><strong>INPUTS</strong></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• Proportion of research funding dedicated to ISR</td>
<td>• Does your university have measures of interdisciplinary success?</td>
<td>• Amount of ISR publications</td>
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<tr>
<td></td>
<td>• Amount of research funding from industry</td>
<td>• Does your university provide specific physical facilities for interdisciplinary teams?</td>
<td>• Proportion of ISR to overall outputs</td>
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<td></td>
<td>• Recruitment of ISR researchers</td>
<td>• Does your university provide specific administrative support for interdisciplinary teams?</td>
<td>• Utility of ISR - out of discipline citation</td>
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<tr>
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<td>• Does your university have a tenure or promotion system in place that recognizes interdisciplinary research?</td>
<td>• Quality of ISR - FWCI</td>
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<td></td>
<td></td>
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<td>• Reputation for interdisciplinarity</td>
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2.3 Collecting the data

There are three ways in which the data for the ISR is collected:

1) The THE data collection portal (a system used in other THE rankings)
2) Surveys of institutions
3) Bibliometric data

THE Data Collection Portal

The portal is a repository for institutions to submit both quantitative data and qualitative evidence for the purposes of being assessed for rankings. For the ISR, institutions are required to provide three quantitative inputs related to the research funding dedicated to ISR, research funding from industry sources, and recruitment of ISR researchers. Institutions also use the portal to supply evidence for the four qualitative processes. This includes evidence regarding measures of success for ISR, facilities for ISR teams, dedicated administrative support for ISR and tenure/promotion specifically for ISR.

Survey

The survey use for ISR was the general THE Academic Survey of global university academics that is also used for the THE World University Rankings which gauges university reputation. For ISR, there were additional questions regarding how academics were encouraged, enabled and rewarded for ISR, to ensure that the output reputation metric was specific to ISR.

Bibliometric Data

Using OpenAlex, bibliometric data was sourced for the four other output metrics, regarding the volume of ISR publications, the overall proportion of ISR publications, the out-of-field FWCI of ISR publications, and quality of ISR publications. This drew from a field of 47 million publications between 2018 and 2022, including 32.2 million journal articles, and 142 million citations.
Overall, 1169 institutions submitted quantitative data to the year one collection for ISR. Of these, 629 were ‘valid,’ where institutions did not withhold submission from any fields. A total of 761 institutions submitted qualitative data around processes, with 710 of those answering ‘yes’ to at least one of the questions.

The following analysis summarizes some of the key high level insights from each of the metric pillars that underpin the ISR; inputs, processes and outputs.

### 3.1 Input Pillar Overview

Figure 3 shows that India has the highest number of institutions participating in ISR with valid submissions, followed by Russia. Only three European countries—Russia, Spain and Italy (Turkey is counted as Western Asia) are represented in the top fifteen. Nigeria, Egypt and Algeria represent Africa, and there is one sole representant from Latin America and the Caribbean, Brazil. Surprisingly there are no representatives from the Anglosphere, with the UK, US, Canada and Australia all outside the top 15. This shows that there is real diversity in the geographical spread of institutions submitting data to the ISR, with a strong performance from countries in the Global South.

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Figure 4 shows that Egypt has the highest proportion of research income dedicated to ISR, followed by Uzbekistan and Saudi Arabia. Six of the top 10 countries for research income dedicated to ISR are in Asia.

Overall, the analysis for the input metric pillar shows that countries from the Global South predominate in terms of the submitting data for ISR, and as such the findings likewise demonstrates those countries have the highest number of research positions dedicated to ISR as well as proportion of funding dedicated to ISR. Egypt is notable as representant from Africa, being in the top 3 for both ISR job adverts and ISR-dedicated research funding. India, Pakistan, Iraq and Indonesia all have significant representation in this metric pillar from Asia, with Russia, Spain and Romania leading the way from Europe.

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3.2 Process Pillar Overview

For the process pillar, submitting institutions were asked to answer four questions reflecting on how their institutions support ISR. These questions are related to the physical facilities of the university dedicated to ISR, dedicated administrative support for ISR, institutional measures of success for ISR and systems of tenure and promotion for ISR.

Institutions were asked to answer yes/no to these questions and provide evidence of processes or policies where they had answered yes.

Figure 5 shows the overall responses from institutions to the process pillar metrics, with those answering ‘yes’ to having these processes in place for ISR. Having physical facilities dedicated to ISR had the most responses, with 650 institutions answering yes. The process with the least amount of institutions saying ‘yes’ was related to having systems of tenure or promotion related to ISR.

Figure 6 also shows that across all four questions, the evidence submitted by institutions to show that they do have these ISR-dedicated processes in place was not relevant. This was particularly the case for ISR-related tenure or promotion, where only 4% of institutions had specific evidence to show that processes were in place. There is therefore significant scope for improving the evidence submitted for ISR-related processes, and could be an incentive for institutions to develop more robust evidencing mechanisms.

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3.3 Output Pillar Overview

The output metric pillar has five metrics, four of which are measured using bibliometric data sourced from OpenAlex. The bibliometrics measure total ISR related publications; proportion of ISR-related publication to overall output; utility of ISR (using out-of-discipline citations); and quality of ISR using FWCI. The other metric for this pillar, the reputation of interdisciplinary teams, is sourced through the survey method.

As the bibliometrics data shows all countries and institutions but not the input and process metric pillars, these metrics offer a more global understanding of the ISR research landscape in terms of volume, focus and quality. The data shows that India and Russia—which both feature heavily in the input and process metrics—also actually produce a high level of ISR relative to their total volume of research, with a higher quality from India. Overall, figure 6 shows that there is a greater presence of European countries than in the input and process pillars, with thirteen European nations having more than 25% of all research dedicated to ISR. Other European countries such as the UK and Denmark have less than 25% ISR, but relatively high quality above FWCI 1.5.

3.4 Institutional Analysis

Country-level data so far has shown greater participation from the Global South, and less presence from countries and institutions from the Anglophone and Europe. However, data at an institutional level shows some strong performances from these countries, where there has been a long history of producing high impact research. Outside of the traditional research powerhouses, there are some ‘diamonds in the rough’ that showcase how institutions in countries that face different challenges unique to the Global South are also performing well. From the United States, California Institute of Technology performed exceptionally well across the input pillar metrics, and sets the global standard in the output pillar metrics (four of which are bibliometric). Massachusetts Institute of Technology and University of Illinois-Urbana Champaign also offer stellar examples in the output metrics. In the US, Boston University demonstrates the best evidence of processes to support ISR.

A similar case can be found in the United Kingdom, with University of Glasgow and University of Bristol performing in the output metric pillar. IMT Atlantique in France, performs the best in the input pillar metric in Europe.

An emerging trend can be seen with institutions in countries that have traditionally dominated the global research landscape performing well on bibliometric data that showcases volume, proportion and quality of ISR, as well as the reputation of those universities in ISR. However, evidence from the data shows that they perform less well in the input and process pillar metrics, which reveal more about the institutions’ intention and dedication towards ISR.

In other areas of the world, there is a great diversification of high performing universities from many countries, many located in Asia or Russia. Air University in Pakistan leads the global standard for input pillar metrics, a similar case for Visayas University in the Philippines. National Taiwan University (NTU) is notable for being an Asian university that performs very strongly across all three metric pillars. Overall universities in Hong Kong and Singapore have the strongest performances in Asia, including The Hong Kong University of Science and Technology (HKUST) and Nanyang Technological University in Singapore.

With the highest number of universities, India has many representatives that perform well in the metrics, though very rarely to the highest global standard across all three. Lovely Professional University is an exception, leading the global standard for the process pillar metrics, as well as excellent performance in the other pillars. In Africa, Cairo University in Egypt, Covenant University in Nigeria and the University of the Witwatersrand perform very well in the output metrics, with the latter also setting the regional standard for input metrics.

Overall, institutions with historic research strengths tend to perform better in outputs than inputs and processes, whereas universities in the Global South lead on participation, inputs and processes. This suggests that whilst there is a strong dedication to ISR in the global south as evidenced by its inputs and processes, the next stage is to improve outputs around research and reputation for ISR, something that can potentially be achieved with greater collaboration with universities in the Global North.
The feasibility study for this project demonstrated that university leaders and leading scholars worldwide believe that interdisciplinary research has an important role to play in solving global problems. Furthermore, they agreed that a ranking of institutions for interdisciplinary research could provide performance indicators and incentives to further strive for greater collaboration between academic disciplines.

Using feedback from the roundtables of what kind of metrics could be used to measure excellence in interdisciplinary research, combined with THE data team expertise in building rankings and collecting and analysing data, a rubric of three metric pillars focusing on inputs, process and outputs was created, covering a total of 12 metrics.

The data collection for year one has 1169 institutions submit data, with varying numbers of institutions providing valid responses across the different quantitative and qualitative evidence submissions. The data clearly shows that participation is being driven by institutions from countries in the Global South, with India having the most participating institutions with valid submissions.

Across the three metric pillars, there are different trends. The input pillar, that includes metrics for the proportion of research income dedicated to ISR and ISR-specific job adverts, shows a strong performance from Asian countries, with Romania and Russia performing strongest out of the European nations. Reflecting the broader trend of participation, input metric pillars suggest a higher level of dedication to ISR in Asia, with Egypt also performing strongly in this metric pillar.

For the process metric pillar, there is some room for improving the quality of data submissions that provide evidence of the processes that support ISR. These can help empower and incentivize institutions to increase the supporting infrastructure for ISR, including physical facilities, dedicated administrative support, measures of success and systems of tenure and promotion reserved for ISR staff.

For the output metric pillar, which primarily reviews bibliometric data, the use of OpenAlex means that all institutions across all countries can be assessed for their ISR contributions and impact, through metrics such as volume of ISR-related publications, proportion of ISR compared to total research output and quality of ISR. As these metrics include all institutions, rather than just those that voluntarily submit data, there is a greater diversity of countries represented. The US and China, both conspicuously absent in the input and processes metrics, demonstrate relatively high quality ISR output, though India and Russia still lead the way in terms of proportion of ISR out of total output.

Finally, institutional level data analysis shows that universities in the Global North tend to perform better in output metrics than inputs or process metrics. There is therefore room for greater dedication to ISR. In the Global South, the converse is true; there is real dedication as evidenced in the inputs and processes, but room for developing global standard research outputs and enhanced reputation.

**Sources:**
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Overall, this report offers some early indicators about how universities could be assessed on ISR. From this initial findings, three areas of potential improvement for universities on ISR include:

1. **More dedicated policy processes to enhance ISR**, including physical facilities, administrative support, and staff incentives such as promotion.
2. **More funding for ISR as a percentage of overall research funding**.
3. **Greater visibility for ISR outputs from the Global South**, potentially through further collaboration with the Global North, to raise impact and reputation.

Furthermore, it is recommended that THE engage a larger range of universities in the Global North to ensure greater transparency in the inputs into ISR and evidence of processes that support the pursuit of ISR.