

B. Case Studies

Case study 1: The Evaluative Inquiry

As an approach to more responsible research evaluation for a stronger and more sustainable science system, the Evaluative Inquiry sits squarely in the middle of CWTS's missions and strategies. Combining insights and methodologies developed in the institute,⁵¹ it deals with science policy, research governance, and science-society relations in evaluative and strategic contexts. It serves as a vital bridge between different audiences and needs, translating between on one hand the knowledge developed in conversation with academic peers, policy actors, or other societal stakeholders, and on the other hand the strategic and evaluative considerations of research units.

Toward Responsible Research Assessment (RRA)

The development of the Evaluative Inquiry should be seen in the context of a larger movement towards more Responsible Research Assessment (RRA). The DORA declaration on research assessment and the Leiden Manifesto for research metrics are examples of widely supported calls to rethink the use of indicators and metrics in evaluations. Moreover, the Dutch Standard Evaluation Protocol (SEP) recently developed into the Strategy Evaluation Protocol to emphasise that research evaluation is done in the context of, and as support to, the missions and strategies of research units.

CWTS has developed the Evaluative Inquiry since 2017, from a concept first proposed in a paper by Fochler and de Rijcke. It inspires our consultancy services in the CWTS BV, and, simply put, 1) helps the client to understand what they want 2) within their research context, 3) tailoring methods to their needs and wishes, 4) offering input for accountability and learning.

A contextual perspective

As the Evaluative Inquiry envisions contributing to a more sustainable science system, its projects serve a research unit's continuous conversation about missions and strategies as much as its duties to account for past performance. This double focus on learning and accountability requires an engaged analyst who is capable of helping clients understand what they want. Rather than anonymously produce run-of-the-mill bibliometric performance analyses, this analyst engages with the client and helps them to situate the research unit's performance within the larger ambitions of its missions and strategies. This requires a contextualization of the research unit's work, making visible the diversity of stakeholders and dynamics that influence the production and communication of knowledge ('productive interactions'). These stakeholders are societal partners as much as academic peers. Moreover, the Evaluative Inquiry's contextual perspective includes organisational structures and cultures as these are of significant impact on research performance, practice, and strategy. The approach offers a vast portfolio of methods and tools to produce

⁵¹For more information, see the paper [Evaluative Inquiry: engaging research evaluation analytically and strategically](#) and the blogpost [The evaluative inquiry: a new approach to research evaluation](#)

insights and evidence for research units. Mixing relevant qualitative and quantitative methods makes visible different elements of scholarly work. We can think of combinations of methods to analyse impact and use, collaboration networks, output, or SWOT analyses. Juxtaposing and triangulating insights from these methods has produced more comprehensive and useful insights. Recently, we have started to include all computational analyses in a dashboard, which we use as input during our project meetings. Moreover, involving the client (and sometimes their stakeholders as well) to make sense of the analyses at multiple moments in the process has resulted in shared ownership over analytical processes and results. The engagement and analyses of the Evaluative Inquiry ideally result in input for accountability, reflexive organisational learning, institutional road-mapping and envisioning, and strategic decision making.

Organisational learning

While all services of CWTS BV ideally tailor methods to serve the purposes of accountability and learning of the client, it has been in the learning category that these principles of the Evaluative Inquiry have been followed most comprehensively. Since, roughly, 2019, CWTS BV conducted 12 projects within this category. Most of these projects were requests for input for the self-evaluation document as part of the Strategy Evaluation Protocol. In all cases, the approach we follow is very similar. It starts with an exploration. We have started taking some time to get acquainted with the client. It pays off to take time to explain our evaluative approach to the client, to help them understand the context and content of the Dutch SEP or other evaluative/strategic contexts, to explore what strategic questions are relevant or interesting to them, and to be clear about what kinds of input CWTS can offer and what else it cannot. This early phase ends with a research proposal serving a clear set of questions and needs with mixed methods. We have found that slowing this process down enables us to be more efficient and effective during the implementation of the research proposal. Throughout the implementation phase we are in touch with the client, engaging them in our analytical work, and adjusting our course if necessary. We've ended these projects typically with a presentation or workshop with the whole research unit present. We have done these projects with units ranging from a Theological University to the discipline of Anthropology as well as one leading up to the CWTS self-evaluation document that this case study is part of. What our clients have reported back to us now resonates with our own experiences: the Evaluative Inquiry helps to make visible research values, strengths and opportunities within the larger context of the research organisation and its peer and stakeholder relations. This input is useful for evaluative and strategic purposes.

Case study 2: Toward a globally inclusive understanding of the science system

The interest of CWTS in strengthening the science system is not limited to the Northern hemisphere. The science system is globally interconnected, and any developments or changes made in the Netherlands or Europe have consequences for the rest of the world. Likewise, we are also affected by developments beyond our immediate sphere of influence, making a complete understanding of the science system unfeasible if we do not consider the global perspective. Therefore, our concern for appropriate research governance and the use of performance indicators, analyt-

ical models, and fairer assessment methods also extends to low and middle-income countries, particularly to the Global South, since the region is often not part of the mainstream debates and developments in our field. In recent years, CWTS has leveraged its internal capacity to establish closer collaborations and more ties with partners from the Global South to gain a mutual understanding of the dynamics and particularities of developments in different parts of the world.

Latin America

Brazil:

While partnerships with Brazil have been in place for nearly a decade, leading to the design of the Brazilian Research Ranking and a series of co-authored publications, the publication of the Leiden Manifesto in 2015 has significantly strengthened bonds with the country. Shortly after the publication of the Manifesto, the Brazilian Agency for Support and Evaluation of Graduate Education (CAPES) organised meetings with the directors of the more than 4,000 graduate programs active in the country. Copies of the Manifesto were provided, and the coordinators of the 49 disciplinary committees in the Brazilian evaluation system were instructed to discuss the evolution of their assessment procedures from its principles. CAPES' own study on how aligned the agency's evaluation was to the Manifesto guided the debate across disciplines, generating an impact throughout the more than 400 higher education institutions (HEIs) conducting research across the country.

From the positive effects of the Leiden Manifesto, CAPES reached out to CWTS to forge a stronger connection between the institute and the Brazilian science system. So far, some observable results are 1) A direct engagement of CWTS in the effort to evolve the Brazilian national evaluation system, including the participation of CWTS researchers as keynote speakers in seminars organised by CAPES with the evaluation leaderships in the country; 2) A PhD project on evolving the evaluation of Brazilian graduate education, developed by a CAPES officer who has been at CWTS since January 2019; 3) A postdoctoral study on self-assessment strategies for the Brazilian science system, inspired by the Dutch experience. This project is under development at CWTS by the former president of the National Forum of Pro-Rectors for Research and Graduate Education (FOPROP), one of the most impactful organisations in the Brazilian research system.

These connections continue to expand thanks to bilateral initiatives in projects (e.g., [InSySPo II](#)), in the engagement of Brazilian stakeholders in the Leiden Ranking and U-Multirank, in the contribution of CWTS researchers to academic training in Brazil (e.g., [University of Brasilia](#)), and in multiple [keynotes](#) and [talks](#) for Brazilian audiences. In 2019/2020, CWTS BV also conducted a study for the Netherlands Innovation Network, reporting on scientific collaboration between Brazil and the Netherlands.

Wider Latin America:

To pursue a strong science system that recognises and values geographical diversity, CWTS also engages with numerous other countries in Latin America, such as [Colombia](#), [Ecuador](#), [Peru](#), [Chile](#), and [Costa Rica](#). Such collaborations benefit from CWTS researchers with Spanish, Galician, or Portuguese speaking capacities who have been making notable efforts to participate in various

dissemination activities in the region. Contributions to foster [responsible evaluation](#) and [open science](#) are particularly relevant, such as [those promoted by CLACSO](#) (Latin American Social Science Council) under the Latin American Forum on Evaluation (FOLEC). In addition, a special issue of the journal *Quantitative Science Studies* (QSS) on 'Scientometrics in Latin America' is currently being edited by CWTS researchers together with colleagues in Latin America.

Africa

Our engagement with partners in the Southern hemisphere started more than 15 years ago with the development of ties with Stellenbosch University (SU). Joint projects with partners at SU and elsewhere in South Africa have flourished since then, particularly when CWTS became an institutional partner in 2015 in [South Africa's Center of Excellence in Scientometrics and Science, Technology, and Innovation Policy \(SciSTIP\)](#) at SU. CWTS projects at SciSTIP have covered a range of topics integral to the CWTS research agenda, such as [social media metrics](#), [African research workforce](#), [innovation](#) and research excellence. Some CWTS staff members teach a course at SU on Advanced Scientometrics. In addition, our involvement in Leiden University's Center for Frugal Innovation in Africa created opportunities and spurred collaboration with partners in sub-Saharan Africa on innovation-related issues. Joint projects with African partners have resulted in a series of co-authored publications, including a book in 2020 that captures views and ideas within Africa and other countries of the Global South on how to transform the notion of 'research excellence' in ways that are better suited for less well-resourced researchers and their national science systems.

Broadening and deepening our activities

Various other CWTS activities and projects also contribute to broadening our engagement with the Global South. In the [SUPER MoRRI project](#), for instance, we work with a group of [country correspondents](#) around Europe, as well as a [global network](#) of partners to study responsible research and innovation worldwide. In addition, a recent series of [webinars on responsible evaluation](#) were conducted with representatives from governments, funding agencies and higher education institutions discussing developments in the [Americas](#), [Africa/Middle East](#), and [Asia/Pacific](#).

As a founding partner of the [Research on Research Institute \(RoRI\)](#), CWTS is also leading a geographical diversity project, investigating geographical diversity in science from the perspective of the Sustainable Development Goals (SDGs), valorisation of local research, local languages, and local publishing infrastructures and more. Those studies are strongly connected to the global networks built either at CWTS, from its roster of international PhD candidates, or through the different projects we are involved in.

A more recent development that illustrates the approach we take to broadening our engagement with the Global South comes from a plan to set up a UNESCO Chair at CWTS. The Chair will focus on diversity and inclusion in global science, with a strong network of international partners, including CLACSO and organisations working on science communication, evaluation and participation in the Global South, such as RedALyC (Mexico), SciELO (Brazil) and PRIA (Participatory Research in Asia).

Case study 3: Using VOSviewer visualisations for contextualisation and participation

Toward contextualization and participation

As discussed in Section 4.4 of the CWTS self-evaluation report 2016-2021, CWTS has put significant effort into developing contextualised and participatory approaches for analysing and assessing scientific research. Such approaches hold the promise of combining detailed information obtained from scientometric data with broader contextual information provided by researchers, evaluators, and other relevant experts. This offers a way to bridge the gap that is often perceived to exist between ‘qualitative’ approaches (i.e., peer review and other forms of expert judgement) and ‘quantitative’ ones (i.e., scientometrics).

In the development of contextualised and participatory approaches, CWTS relies heavily on scientometric visualisations. While numerical scientometric indicators can be very useful, they are often interpreted in simplistic ways that lack sufficient nuance. Scientometric visualisations instead invite people to discuss different interpretations that can be given to patterns emerging from scientometric data, thereby encouraging people to truly engage with the data. Being able to make productive use of scientometric data while also reflecting critically on what the data tells is essential in the development of responsible scientometric practices.

Another key step in the development of contextualised and participatory approaches is the transition from proprietary data sources that impose significant restrictions on how data can be used to data sources that offer free access to data or that even make data available in a fully open way (see also Section 4.3). Restrictions on how data can be used limit the possibilities for developing contextualised and participatory approaches, for instance because information can be presented only at an aggregate level, not at the level of the ‘raw’ data, or because information can be presented only in static documents, not in interactive online reports.

Enabling contextualization and participation using VOSviewer visualisations

To create and explore scientometric visualisations, ideally based on data sources that impose minimal restrictions on the use of data, CWTS relies extensively on the VOSviewer software tool. This tool can be used to create interactive visualisations of scientometric networks, ranging from co-authorship and citation networks to networks of terms co-occurring in scientific publications and networks of research fields and their connections. VOSviewer is developed in-house at CWTS and is made freely available at www.vosviewer.com. The development of VOSviewer is led by Nees Jan van Eck, senior researcher at CWTS.

In recent years, support has been added to VOSviewer for creating visualisations based on the following scientometric data sources:

- Crossref⁵²
- Dimensions⁵³
- Europe PMC, Semantic Scholar, OpenCitations Corpus (OCC), OpenCitations Index of Crossref open DOI-to-DOI citations (COCI), and Wikidata⁵⁴
- Microsoft Academic⁵⁵
- Lens⁵⁶

These data sources have freely accessible websites and many of them make their data openly available, so that the data can also be freely reused. For most of these data sources, VOSviewer provides a convenient way to enable users to retrieve data directly through the API of the data source, avoiding the cumbersome process of manual downloading of data.

Recently CWTS released VOSviewer Online, a web-based version of VOSviewer.⁵⁷ This open source software tool allows VOSviewer visualisations to be explored interactively in a web browser. A user can easily share a visualisation with others by sending them a link to the visualisation. The new features provided by VOSviewer Online greatly simplify the use of VOSviewer visualisations in participatory approaches for analysing and assessing scientific research. Such approaches are also facilitated by the integration of VOSviewer Online in web-based platforms that provide access to scientometric data. VOSviewer Online has already been integrated in two platforms, Dimensions⁵⁸ and AI Research Navigator, and we expect more integrations to take place in the coming years.

Use of VOSviewer

VOSviewer is used by a range of actors in the research system, from individual researchers and research groups to policy makers and their staff at research institutions, research funders, and scholarly publishers.

The use of VOSviewer by researchers can be traced relatively easily by looking at research articles in which VOSviewer is mentioned or in which the publication in which VOSviewer was introduced⁵⁹ is cited. Using the full-text search in Dimensions, we found about 9,000 articles in which VOSviewer is mentioned. In addition, we were able to identify 3,100 articles that cite the publication in which VOSviewer was introduced. This publication is in fact the most highly cited article among

⁵²Visualizing freely available citation data using VOSviewer

⁵³Discovering Relationships Between Researchers and Publications Using Dimensions Data Just Got a Lot More Colorful!

⁵⁴VOSviewer supports large number of new data sources

⁵⁵Mapping science using Microsoft Academic data

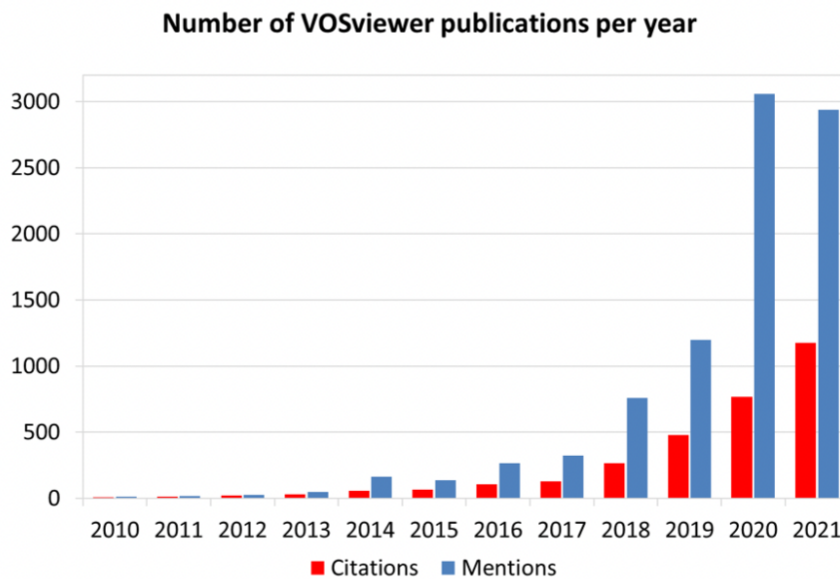
⁵⁶VOSviewer goes online! (Part 2)

⁵⁷VOSviewer goes online! (Part 1)

⁵⁸Visualize Networks Instantly Within Dimensions

⁵⁹Van Eck, N.J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, 84(2), 523–538). <https://doi.org/10.1007/s11192-009-0146-3>

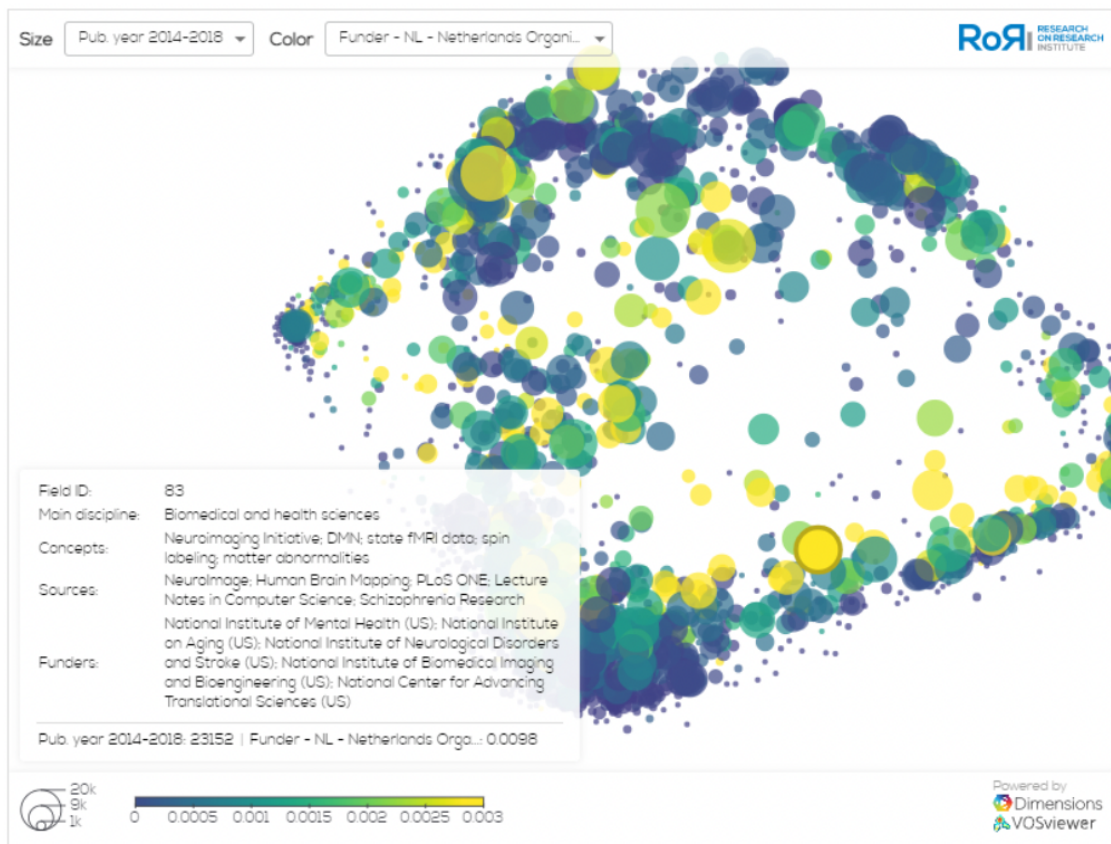
the almost 7,000 articles published in the journal *Scientometrics* since its launch in 1978. These statistics clearly demonstrate the widespread use of VOSviewer by researchers. The chart presented below shows how the use of VOSviewer has grown over time. While the year 2021 was not yet finished at the time of our analysis,⁶⁰ VOSviewer had already been cited in more than 1,100 articles published in 2021 and it had been mentioned in almost 3,000 articles.



VOSviewer is also used a lot in scientometric analyses that support research evaluation and research management. For instance, CWTS BV regularly uses VOSviewer in commissioned projects. The software is used in about ten projects per year, serving clients ranging from universities and other research organisations to funders, publishers, governments, and companies. In recent years, the software has often been used to visualise so-called research landscapes, presenting detailed article-level classifications of the scholarly literature. These landscapes for instance show the activity and the impact of an organisation in different research areas. An example is provided by the interactive funding landscape created for the Research on Research Institute (RoRI; see the figure below).⁶¹

⁶⁰We performed our analysis on December 1, 2021.

⁶¹[RoRI Research Funding Landscape](#)



There is also a significant interest in training and education in the use of VOSviewer. CWTS organises an annual VOSviewer course attended by 20 to 25 participants.⁶² Dedicated on-site courses have been organised as well,⁶³ including an extensive training program for researchers at TU Delft in the context of the AIDA (Automatic Identification of Research Trends) project.⁶⁴ VOSviewer also features prominently in other scientometric courses organised by CWTS. Overall, VOSviewer training events are attended by at least 100 participants per year. A YouTube video providing a brief introduction to VOSviewer has been viewed almost 130,000 times.⁶⁵

Next steps

In the coming years, CWTS plans to work on further extending the possibilities for using VOSviewer visualisations in contextualised and participatory approaches for analysing and assessing scientific research. At a technical level, this will require further integration of VOSviewer in business intelligence dashboards and online platforms, ensuring easy access to VOSviewer visualisations and the underlying data. In addition to the integrations already available, several others

⁶²[Visualising science using VOSviewer](#)

⁶³[Visual exploration of scientific literature with VOSviewer](#)

⁶⁴[Research Positioning & Trend Identification: a data-analytics toolbox](#)

⁶⁵[Introduction to VOSviewer](#)

are currently being prepared, for instance in the VIVO-based National Open Research Analytics (NORA) platform in Denmark. Our primary focus will be on connecting VOSviewer to open data sources, since these data sources are most suited to support contextualised and participatory approaches to the use of scientometric data. At a socio-technical level, we aim to develop best practices for using visualisations in participatory approaches such as the Evaluative Inquiry. Some further discussion on the next steps we plan to take can be found in a recent blog post.⁶⁶

⁶⁶[VOSviewer goes online! \(Part 2\)](#)