



Confidence in Science: How to ensure sustainable and trustworthy channels of scientific information?

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About this report

The COVID-19 pandemic has brought the importance of science into sharp focus. It has also highlighted significant challenges for the research community, including the need to navigate an increasing amount of misinformation and greater public scrutiny of research than ever before. Trust and confidence in research are vital for our collective ability to tackle the most pressing global challenges, from climate change to future pandemics.

In parallel, there have been growing calls for “open science” over the past decade, especially in Europe, and in part to meet the challenges of developing trustworthy and reliable scientific findings. The Council of the European Union recently emphasised the importance of a high-quality, transparent, open, trustworthy and equitable scholarly publishing system in supporting open science for the public benefit.

This paper summarises a multi-stakeholder roundtable discussion regarding mechanisms to support the EU in the creation of an environment in which “the outcomes of research and innovation are understood and trusted by informed citizens and benefit society as a whole.” The event, which took place on 15th June 2023, was hosted by Science|Business in partnership with Elsevier, a global leader in scientific publishing and data analytics supporting the research and healthcare communities. The roundtable brought together experts from the EU institutions, academia, scientific publishing, media organisations, research assessment and other sector-specific stakeholders. Science|Business is ultimately responsible for the content of this report.

Rapporteur: Brandon Mitchener

Editor: David Pringle

Project Director: Maryline Fiaschi

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Rue du Luxembourg 19, 1st floor, 1000 Brussels, Belgium
Info@sciencebusiness.net

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Conclusions and recommendations

The roundtable discussion gave rise to the following conclusions and recommendations:

Ensuring trust in science

- > Both policymakers and the public are demanding science they can trust as a prerequisite for better public and private decision-making. Trust in science depends on research integrity, inclusiveness and quality control processes that are rigorous, consistent and well understood by policymakers and the public alike.
- > Peer review – the central form of academic self-governance – is an indispensable and well-established element of quality control and public trust in the scientific publishing process. It can't be readily replaced by an alternative system. A global survey by The Economist Impact in collaboration with Elsevier found that researchers view peer review as the top driver of trust in research and that since the pandemic European researchers are more likely to ensure their work is peer reviewed. Active participation in the peer review process should be part of the criteria for assessing and rewarding researchers.
- > Peer review is under pressure from fraudulent actors such as so-called ‘paper mills’ which produce large numbers of fake research papers. Fast evolving generative artificial intelligence tools are exciting, but also pose a risk to the integrity of, and therefore trust in research, by increasing opportunities for fraud and plagiarism at an industrial scale. Publishers need to invest in processes and tools that can identify such submissions and blacklist those who submit them.
- > Governments and academia worldwide invest around \$2 trillion in research and development every year. A key component of the desire for open science is the call for the results of this taxpayer-funded research to be made as openly accessible as possible for the public benefit.
- > Europe is perceived to be leading the push for open science by means of policies and implementation at member state level, potentially setting an example for the rest of the world.





- > Whereas calls for greater openness have historically focused on access to manuscripts and publications, many scientists consider access to the underlying data on which research is based to be equally important and one key to ensuring the rapid sharing and reproducibility of research. In the context of the Covid crisis, the international, interdisciplinary and public-private sector collaboration led to the development of vaccines in record time, supported by the rapid and open sharing of data.
- > While some traditional measures for the quality of scientific research, including citation counts, are good proxies, many have been over-used. These exacerbate inequities in the scientific establishment, including discrimination against women taking career breaks or scientists in the Global South. Broader assessment measures and indicators would help address these issues: A combination of qualitative assessment and responsible use of quantitative indicators would be the basis of a fairer and more inclusive assessment system.
- > The traditional process of scientific publishing can be slow. It should be accelerated, but not at the expense of the peer review process that safeguards quality and integrity of research. There is a case to be made for a combination of both pre-publication communication among specialists and publication in peer-reviewed journals before broad public dissemination.
- > To advance high-quality open science, a collective effort and collaboration of all stakeholders is required. An ongoing dialogue is needed with member states, the R&I sector, research communities, publishers and universities.

Building public confidence

- > A fall in public confidence in science has many different causes that are often unrelated to the way that scientific research is funded and disseminated.
- > Better, more effective communication of research would help. Scientists need help to improve the communication of their research to policymakers, journalists and the public. The European Commission, as well as publishers, is experimenting with artificial intelligence tools that could summarise research results in an easily digestible and audience-specific way.
- > Citizens and policymakers need to understand that scientists prize scepticism and doubt to ensure rigour, reflection and correction, where necessary, of the scientific record over time. Citizens and policymakers need to be educated about the differences between scientific consensus and the work of individual scientists and of the existence of routine research assessments.



- > Misinformation and the speed with which it spreads have multiple causes and no easy fixes. Social media and some traditional media help spread misinformation but are not necessarily the root cause. Misinformation spread by some individual policymakers, scientists and governments can also contribute to the problem.
- > The process of research assessment is a potentially important tool in strengthening public confidence in the scientific method. Greater standardisation of research assessment from country to country and education about these scientific checks and balances could help the public understand that scientists are subject to institutional scrutiny.
- > Combatting knowledge resistance in society is more about human psychology and behavioural science than about facts and will require a new and concerted approach on the part of scientists, policymakers, the media, educators and others in a position to curate the conclusions of scientific research for a larger public.
- > Both traditional and social media should be encouraged to publish and prioritise evidence-based and consensus scientific opinions, and be deterred from actively facilitating the spread of misinformation. Many participants in the roundtable were exasperated with the fact that media and social media profit from the publication and sharing of sensationalist and sometimes outright false information. These outlets need incentives to prioritise factual information and consensus views, for example, by being rewarded for “active, knowledge-based curation.”



Context

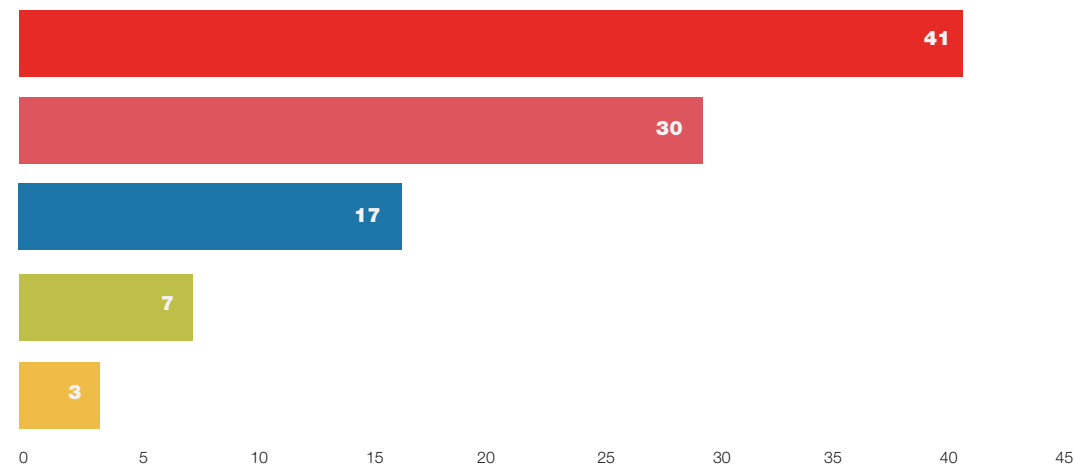
The dual backdrop for the roundtable was the experience and impact of COVID-19 pandemic on research and public confidence, as signalled by public scepticism about new genetic approaches to vaccine development —despite a global scientific consensus that these technologies were safe and effective—and the Council of the EU’s recent call for “high quality, transparent, open, trustworthy and equitable scholarly publishing.”

A global study of more than 3,100 researchers by The Economist Impact in collaboration with Elsevier, published in November 2022, revealed a growing concern among European scientists about misinformation, politicisation and over-simplification of scientific research. One-third of European researchers even said they had personally experienced or knew a close colleague who had experienced online abuse—a figure that rose to 42% for respondents in North America

The Impacts of the pandemic on the research community

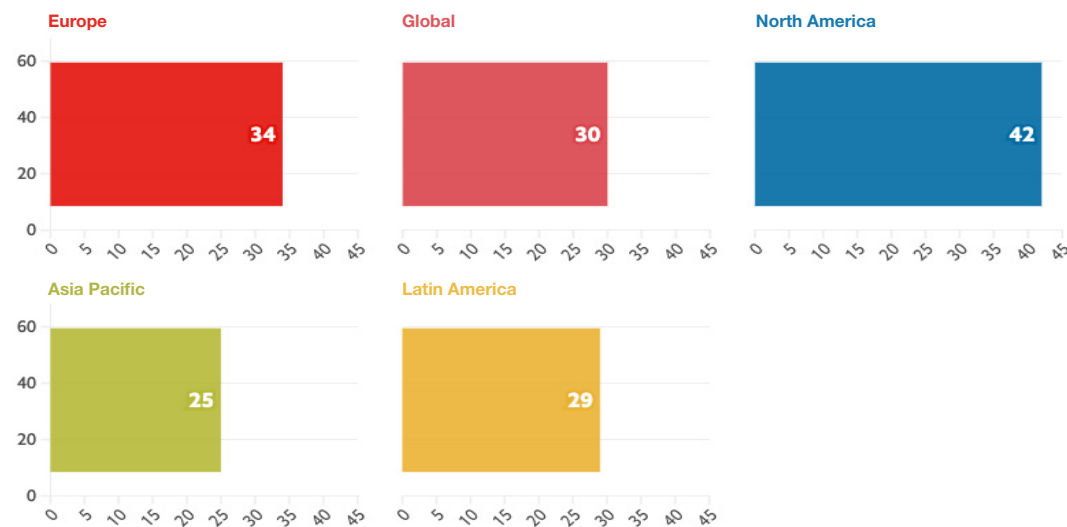
● Strongly agree ● Agree ● Neither agree nor disagree ● Disagree ● Strongly disagree

The pandemic increased the importance of separating good quality research from misinformation



Prevalence of abuse or acrimonious interactions online

% of respondents who have experienced/know a close colleague who has experienced some form of online abuse, per region



Charts extracted from the Economist Impact’s “[Confidence in research](#)” study.



The COVID pandemic is, of course, not the first time that people have questioned the validity of science and public policies. One participant cited long-running public scepticism around genetically-modified foods and pesticides despite the overwhelming scientific consensus in support of their use. As a result, some non-governmental organisations, some governments and individual citizens, especially in Europe, have questioned their safety and have refused to accept them. At the same time, the impact of public scepticism should not be overstated: as one participant noted, while millions of people may have questioned the safety or efficacy of COVID-19 vaccines, billions of people were grateful to receive them.

Nevertheless, the rapid spread of misinformation about COVID vaccines was seen to be a wake-up call for the scientific establishment, with some individual researchers campaigning against misinformation and others actively promoting their own contrarian research—ultimately at the cost of confidence in science and in human lives. The apparent lack of scientific consensus on vital public health questions contributed to public doubts about both the integrity of scientific research and the motivations of governments, the pharmaceutical industry and the medical establishment. Oldrich Tuma, president of ENRIO, the European Network of Research Integrity Offices, contended that the proportion of the population believing in conspiracy theories probably varies according to cases and countries concerned and could be in some cases higher than 5%. But even this is a non-negligible number and should be taken seriously.

EU policymakers are increasingly calling for publicly funded research to be made more easily accessible. On 23 May this year, the Council of the EU unanimously voted to continue to accelerate “open science” in what it said was as an essential step to improve research quality, efficiency and impact. “If we really believe in open science, we need to make sure that researchers can make their findings available and re-usable and that high-quality scientific articles are openly accessible to anyone that needs to read them,” Mats Persson, the Swedish Minister for Education and Research, said at the time. “This should be particularly the case for research that benefits from public funding: what has been paid by all should be accessible to all.”

Against this backdrop, participants in the 15 June roundtable discussed the state of play in open science, how to balance quality, openness and integrity of research and how responsible research assessment could help build confidence in scientific research overall.

Open science: panacea or pipe dream?

The first part of the roundtable was devoted to the concept of open science and the EU's plans to promote it. Views spanned the full spectrum from those who saw it as the solution to almost all of society's problems and others who said it was a dangerous distraction.

Speakers from the Council of the EU and the European Commission highlighted the relevance of open science as a "key democratic principle" that can bring research and society together, arguing that increased transparency and access are absolutely essential to ensuring public trust in science. They also noted that policymakers are intent on tackling the perceived rising cost of scientific publications by continuing to push for transparent pricing.

Beate Eellend, deputy director of the Division for Research Policy of the Swedish Ministry of Education and Research, noted the Council's recommendations recognise the essential role of peer review and includes proposals for capacity building and revising the criteria on which researchers are judged. Many aspects of the Council's recommendations "might have significant implications for the direction of scholarly publishing," she said.

“ *I share the overall ambition of the Council Conclusion; scholarly publishing should be high-quality, transparent, open, trustworthy and equitable.* ”

Kumsal Bayazit

In response, Kumsal Bayazit, CEO of Elsevier, emphasised the need to build bridges towards the creation of systems and approaches that support trustworthiness in open science, as a model that can benefit research and society, drive better outcomes and increase return on R&D investment. "I share the overall ambition of the Council Conclusion; scholarly publishing should be high-quality, transparent, open, trustworthy and equitable. These are important and ambitious goals to be achieved together."

The call for collective action was echoed by Anna Panagopoulou, director for European Research Area & Innovation, DG Research & Innovation at the European Commission, who placed the accent on the challenges of implementation and the strong political support needed to promote open science as the modus operandi in Europe and internationally.

Other participants, instead, were outright dismissive of the idea that open science in itself would fix anything. Manuel Heitor, a former Portuguese Minister for Science, Technology and Higher Education, cited recent Spanish media coverage decrying the publication component of open science as leading to the emergence of some unscrupulous publishers, which in turn are "destroying" the traditional scientific publication ecosystem that has contributed to the successful expansion of European science.

Anna Panagopoulou



Kumsal Bayazit

Manuel Heitor



Jean-Claude Burgelman



Jean-Claude Burgelman, professor of open science at the Free University of Brussels and director of the Frontiers Planet Prize, said trust has nothing to do with open science. Trust is a generic challenge of all science as such and often presented as a much bigger problem than it really is. No one doubts the science behind airplanes is trustworthy, and billions of people trusted the science behind the COVID vaccine, he noted. The main value of open science is increasing the return on investment of publicly-funded research, to start with, by ensuring "fast and reusable science." Accessibility dramatically improves the rapid build up and spread of knowledge, and in the case of the COVID-19 pandemic, helped accelerate the development of COVID vaccines, he said.

“ *In certain disciplines at least the actual publication will become the dataset, duly curated and presented, and the article will be the annex so-to-speak.* ”

Mathieu Denis

Several participants noted that systematically connecting data sets to published research would be a quick win for society because that helps other scientists reproduce research and therefore validate and reinforce confidence and public trust in scientific research conclusions more quickly. "It's not impossible that we're moving towards a situation where in certain disciplines at least the actual publication will become the dataset, duly curated and presented, and the article will be the annex so-to-speak," said Mathieu Denis, senior director at the International Science Council.

Trade-off between openness and quality?

If there was one thing on which everyone at the roundtable agreed on, it was that scientific checks and balances, including rigorous peer review, are at least as important as accessibility. A thorough peer review process underpins high-quality research and needs to be maintained and its benefits explained to politicians and the public at large.





“Peer review is the bedrock of quality and trust in research. It is also the bedrock of global academic self-governance,” said Kumsal Bayazit. “It’s not an institution, a country, a company that decides what good science is, it’s the global academic community.” Elsevier is investing in new tools to help the expert editors who manage the peer review process for its publications broaden scientific participation in the process while remaining 100% editorially independent, she said.

Several participants emphasised the gap between the rigour of good science and the way mainstream media and social media report, distort and amplify misinterpretations of scientific research. Research that contradicts previous findings is not evidence of a failure of science, for example, but a perfect example of how science should work, constantly testing and verifying previous research. “Mistrust is, in a way, essential to the scientific enterprise,” Denis noted. “Science is about testing reproducibility and replicability, and it is about continuous re-evaluation of what we think we know. Mistrust is part of that.”

However, some media, interest groups and politicians may spin such re-evaluations as a critique of the scientific system as a whole. The only solution to that seems to be better education all-around: better educated journalists, better educated politicians and better educated society as a whole.

“ ***The Council conclusions surprisingly do not mention AI and the rise of generative AI that may be disruptive and risks to overrun the complete system.*** ”
 Mattias Björnmalm

Participants identified several serious threats to high-quality scientific research. First and foremost of these is growing fraud and plagiarism, which in turn is being driven by generative artificial intelligence tools, such as ChatGPT. While many organisations see a future role for these tools in summarising complex scientific research in simple terms, they stressed significant investment is needed in tools to identify plagiarism and fact-check citations. A note of caution came from Mattias Björnmalm, Secretary General of the network of research-intensive Science & Technology Universities, CESAER: “The Council conclusions surprisingly do not mention AI and the rise of generative AI that may be disruptive and risks to overrun the complete system.”

Mathieu Denis



Matthias Björnmalm



Strengthening research integrity with systematic research assessment

In addition to strengthening science literacy through training and other means, several participants, including Thierry Coulhon, president of the French High Council for Evaluation of Research and Higher Education, underlined the potential of systematic and harmonised approaches to research assessment to incentivise both better science and better science communications.

Unfortunately, the average EU citizen is completely unaware of the existence of formal research assessments. They don’t know that such evaluation mechanisms exist to ensure that best practice scientific protocols are followed and that results are reproducible. “There is no research without some form of assessment,” said Coulhon. “People need to know it.” Simply informing people about the existence of formal scientific assessment processes could therefore help reinforce public trust in science.

At the same time, the process of research assessment may benefit from greater harmonisation and exchange of best practices between countries and institutions. Research assessment historically focused on individuals and citations, for example, and in some countries it still does. But research assessment in others, including in France and Italy, increasingly focuses on institutions and includes criteria, such as the attractiveness of research jobs and careers.

Assessment of individual scientists, meanwhile, increasingly includes evaluation criteria such as data integrity, inter-disciplinary collaboration, reproducibility, diversity and the quality of their engagement with the public. Open science methods may gradually be introduced and considered in evaluation criteria, said Marco Malgarini, director of the research unit responsible for research evaluation at Italian agency ANVUR, citing reproducibility of results as an example. The ideal, he added, is a mixture of quantitative and qualitative criteria and evaluation of both institutions and individual scientists that is consistent from country to country and institution to institution and encourages best practices in both scientific research and in science communications.



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