Open science is facing headwinds

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Within the scientific community, the words "open science" have been on everyone's lips in recent years. Open science entails a great promise of a democracy of knowledge, and it is considered to be a universally good

thing. In the words of the UN Declaration of Human Rights: "Everyone has the right to share in scientific advancement and its benefits."

So, how could anyone disagree with the beautiful principles of open access to knowledge? Who could object to the openness of research articles, research data and research methods?

Openness means changes in the management, sharing and storage of data, and it also challenges the traditions of scientific publishing. Indeed, esteemed science publishers have been engaged in a very profitable business. A 2017 article in the Guardian estimates the total global revenue of scientific publishing to be more than 22 billion euros, with the most successful journals making profits of more than ten percent.

The demand for research articles to be openly accessible is contradictory to the business logic of international scientific publishing.

"Science publishers do not take kindly to losing business. Now, they are offering the opportunity to pay for an article to be made openly accessible, making universities or individual researchers cover the costs," Library Director Ari Muhonen from the University of Eastern Finland Library says.

The fact that someone has to pick up the bill is also understood.

"People working in publishing are doing real work that costs real money. Even open science cannot be free of charge. But who should pick up the bill? That's the question. In any case, there are costs that need to be covered," says Tomi Rosti, Information Specialist and an expert on open science, from the University of Eastern Finland Library.

Open science is also made complicated by the fact that researchers' scientific merits are tied to reputable scientific journals. In the eyes of

the international scientific community and research funders, there is different level of appreciation for a research group that publishes in journals the likes of *Nature*, *Science* or *Cell*.

"The merit of a study then stems from the journal and not from the article itself. In the case of open science, if the merit doesn't stem from the journal, then from where? It should also be remembered that scientific journals carry out peer review of their articles. Even if all knowledge were openly accessible, scientific journals would still be needed," Muhonen estimates.

The pressure for open access publishing is also increased by the fact that research funders have begun to demand and require that the principles of open science be observed in research funded by them.

National policy is being gradually built

Although open science is facing some headwind, open access to scientific knowledge and research data is constantly promoted on a national level. The University of Eastern Finland, too, is involved in the preparation of policies of open science and research in Finland. Tomi Rosti has been leading the policy component for open research data, coordinated by the Federation of Finnish Learned Societies.

"The Declaration for Open Science and Research is being formulated bit by bit, and the various policy components contain recommendations for open science actors. The comprehensive set of policies has been created over the past years," says Rosti.

According to Rosti, Finland takes a broader perspective to open science than the other Nordic countries.

"In the Nordic and Baltic countries, the focus of open science is more on

infrastructure and data, whereas Finland has quite comprehensively taken into account open science in all its entirety. In Finland, there is also a desire to involve the scientific community in the development of open science."

According to Muhonen, Finland's strength with regard to open science lies in its comprehensive thinking. Extensive opportunities to participate in the drafting of national policies has meant a higher degree of commitment, but also a slower progress. University libraries and research administrators in particular have promoted open science. Currently, most Finnish universities have made 80% of their researchers' peer reviewed articles openly accessible.

"The role of university libraries in the development of open science has been solid, but different universities have moved forward at a different pace. The University of Eastern Finland, too, must review its open science policy to ensure that it is in line with the national ones. That's why we have set up a working group on open science that I'm leading. That's how we'll get things started," Muhonen says.

Data protection poses a challenge to open data in human and health sciences

According to the Declaration for Open Science and Research, "Research data and methods are as open as possible and as closed as necessary." Within the multidisciplinary scientific community of the University of Eastern Finland, open access to research data and methods is progressing at different rates on a field-specific basis.

"In natural sciences, open sharing of research data and methods is relatively easy. For example, climate data is being shared globally, but as soon as we are dealing with personal data in research, we start to face

some small challenges," Rosti explains.

The European Data Strategy includes the so-called FAIR principles, which are intended to make data findable, accessible, interoperable and re-usable. According to Muhonen, the FAIR principles support open science in natural sciences, but things get more complicated in human and health sciences. In those fields, personal data and identifiers often need to be taken into account, and the EU's General Data Protection Regulation sets strict rules on the use of personal data. This means plenty of work for information specialists and legal experts working in universities.

"Data can be almost anything. For example, water samples, medical samples and survey results are data. Which of them can be shared with others is a thing to consider. It makes sense to start the opening of data from where it is possible. All in all, it's a huge field," Muhonen says.

Data management should be taken into account already when planning research

The opening of data may create an illusion that all research data can be googled in the spirit of open science.

"When a set of data is opened, it is not necessarily freely available to everyone, but may require a research permit for its use. Even open data may be contained within closed doors for reasons such as data protection ," Rosti says, correcting false assumptions.

Open data does not mean easier use: people capable of using such data are still needed. Open data must be accompanied by sufficient documentation so that the data set can be understood also by others than the researcher who created it. This is why researchers should take data

and quality management into account already when planning their research.

"Researchers must think about what kind of data are needed, when they should be collected, and what happens to them after the study is completed. This is a significant change in how scientific research is conducted," Muhonen says.

Who owns open data?

Research data also lead to questions about ownership: whether a data set is owned by a researcher, or to what extent and when the ownership is transferred to their employer. Here, too, legal aspects are strongly linked to open science.

Researchers are interested in the right of priority to data, but no one is really interested in data that everyone's already used. If, on the other hand, a study is conducted in collaboration with a company, the company will also obtain the right of priority to the data produced. Yet, even doctoral dissertations authored in collaboration with companies are, as a rule, public.

"Finnish legislation demands that academic theses be publicly available. However, company-specific information may be partly classified," Rosti explains.

With regard to open access publishing of studies conducted in collaboration with companies, Rosti returns to the funding of open science: how could companies be involved in the funding of open science when, at the moment, the costs are mainly covered by research organizations?

"This requires a change of thinking and discussion with the business

community."

Openness as a fundamental value of science

While recognizing the challenges of open science, its benefits are widely acknowledged: open science significantly contributes to the transparency of science and scientific research, as well as to the availability and impact of research findings in society. It boosts innovation and also helps to develop critical thinking and science literacy throughout society.

The vision of the Declaration for Open Science and Research 2020–2025 is for open science and research to be integrated in researchers' everyday work. Indeed, openness is seen as a fundamental value of science.

"Open science must be a natural part of university research and education right from the beginning of studies. It must be internalized as a principle of operation, and not as something superficial that is remembered if and when convenient," Ari Muhonen says.

Provided by University of Eastern Finland

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