REPLACING ACADEMIC JOURNALS

Authors:

Björn Brembs, Universität Regensburg, Germany
Philippe Huneman, IHPST, CNRS, Paris, France
Felix Schönbrodt, LMU Munich, Germany
Gustav Nilsonne, Karolinska Institutet, Sweden
Toma Susi, University of Vienna, Austria
Renke Siems, Reutlingen, Germany
Pandelis Perakakis, Complutense University of Madrid, Spain
Varvara Trachana, University of Thessaly, Larisa, Greece
Lai Ma, University College Dublin, Ireland
Sara Rodriguez-Cuadrado, Autonomous University of Madrid, Spain

Summary

Status quo. Replacing traditional journals with a more modern solution is not a new idea, but the lack of progress since the first calls more than 15 years ago has now convinced an increasing number of experts that a disruptive break is now necessary. The list of problems that have been accumulating is long, but three stand out as the most severe: The insight that empirical results can be less reliable than expected ("*replication crisis*"). An "*affordability crisis*" is the consequence of large international corporations that each own their separate monopoly on scholarly content and enjoy an exemption from spending rules such that they can dictate conditions. A lack of digital modernization has caused a further "*functionality crisis*", where some of the most basic digital functionalities are missing for research objects.

Prospects. The reason for three decades of inaction is a social dilemma, where every player - researchers, library or institution - is at a disadvantage if they move (first), so they all remain locked-in. Reminiscent of the big internet platforms, the corporate publishers exploit this lucrative situation by using their massive profits not only to resist and delay any research- and public-oriented reform, but to fund a reform of their own and on their own terms: The major publishing houses are secretly tracking their academic users in order to, among other reasons, expand their monopolies beyond scholarly texts. Over the last decade, the four leading publishing houses have all acquired or

developed a range of services aiming to develop vertical integration over the entire scientific process (Fig. 1). For any institution buying such a workflow package, the risk of vendor lock-in is very real: without any standards, it becomes technically and financially nearly impossible to substitute a chosen service provider with another one.

Replacement goal. Any solution needs to not only solve the current problems but also be capable of preventing the takeover by the corporations. Technically, there is broad agreement on the goal for a modern scholarly digital infrastructure: it needs to replace traditional journals with a decentralized, resilient, evolvable network that is interconnected by open standards under the governance of the scholarly community. It needs to replace the monopolies connected to the journals with a genuine, functioning and well-regulated market. In this new market, substitutable service providers compete and innovate according to the conditions of the scholarly community, avoiding another vendor lock-in.

Open infrastructures. In order to ensure the substitutability of workflow service providers, content needs to be stored and made accessible according to a set of enforced standards. These standards need to be open, under the governance of the scholarly community. The basis for such standards exists and only needs to be expanded, adopted and enforced. Thus, a standards body, analogous to, e.g., the W3C, needs to form under the governance of the scholarly community to allow the development of open scholarly infrastructures servicing the entire research workflow. There already are independent, non-profit platforms where service providers can be substituted. Scholarly institutions have a long history of publishing the work of their scholars, as well as striving to develop a global library of interoperable repositories. Combining these long-standing initiatives with existing open infrastructure developments is now within reach.

Money. Redirection of funding from the legacy publishers to the new framework can be realized in a variety of ways. One of them is already established and has been used for decades. Funding agencies have ensured minimum standards at funded institutions by requiring specific infrastructures. These requirements, updated to include the new framework, provide exquisite incentives for institutions to redirect their infrastructure funds from antiquated journals to modern technology. With journal articles currently being overpaid by a factor of ten, the amount of funding is more than sufficient to establish any desired technology. Such updated eligibility criteria by funding agencies would help realign the financial incentives for recipient institutions with public and scholarly interest.

Vicious cycle

After three decades of deterioration, more and more experts consider the scholarly journal system fundamentally broken and demand that it be replaced. Most recently, Robert Terry, project manager at the World Health Organization stated at the R&I Days of the EC DG Research and Innovation that "The whole concept of a 'journal' is kind of dead actually. What we need is a complete rethink", to strong support from the DG Jean-Eric Paquet [1]. Replacing traditional journals with a more modern solution is not a new idea [2-10], but the lack of progress since the first calls more than 15 years ago has convinced an increasing number of experts that the time for small tweaks is long gone and a disruptive break is now overdue.

The most prominent problem, with already realized legislative consequences, is the observation that empirical results can be less reliable than expected, an issue recognized as the "*replication crisis*". Evidence suggests that the most prestigious journals, the ones where researchers must publish in or perish, are partly responsible for the observed lack of reliability by capitalizing on surprising, too-good-to-be-true results and lacking proper quality controls [11]. The journal system is funded by academic libraries who pay subscription and/or publication monies to an oligopoly of large international corporations who each own their separate monopoly not only on the scholarly content in their journals, but also on assigning academic credibility via their journal brands. Over several decades, their "single source exemption" from procurement rules has led to an "*affordability crisis*": Financial reports reveal corporate profit margins exceeding 40% and excess public spending on the order of a factor of ten, compared to market-based pricing [12]. A lack of digital modernization has caused a further "*functionality crisis*", characterized not only by missing digital tools needed to combat unreliability, but also by researcher time wasted on antiquated procedures, e.g., in discovery, submission or review.

These three crises fuel each other in a vicious cycle: the affordability crisis prevents institutions from combating the functionality crisis. The functionality crisis, in turn, fuels the replication crisis, for instance by making peer-review more cumbersome and by making research data and code harder to discover, access and scrutinize. The journals propagating the replication crisis keep exacerbating the affordability crisis with super-inflationary price increases [12-14]. Thus, all three scholarly crises are interlocked in an ever-deteriorating vicious cycle, at the heart of which lies a public good in private hands: the scholarly literature. In this social dilemma, every player is at a disadvantage if they move (first), so they all remain locked-in: Neither researchers – forced to publish in journals due to the "publish or perish" reality – nor libraries – serving the reading and publishing needs of their faculty – are in a position to initiate reform. The corporate publishers are the only player profiting from this system. They exploit this lucrative situation by using their massive profits not only to resist and delay any research- and public-oriented reform, but to fund a reform of their own and on their own terms. Their 'reform' is not aimed at increasing the reliability of science or decreasing the financial burden on public institutions. Their reform aims to multiply corporate revenue streams and market power even further.

Surveillance capitalism

The major publishing houses, in no need of personalized advertisements due to handsome taxpayer funding, have recently been found to secretly track their academic users [15-17]. They use the data to create personal profiles of academic behavior, such as when a user is searching for which topics, which journals or articles they open, or what sections of the documents they spend most time on. In their analysis, the German funding agency DFG has identified a whole host of unacceptable issues with this practice [15]. It constitutes a violation of fundamental rights: freedom of research and teaching are enshrined in the constitutions of many liberal democracies. Such tracking not only infringes on academic freedom, it also constitutes a violation of the right to protection of personal data, an encroachment of competition law, and reduces the value of public research investment, since data on research activities can be collected by commercial research competitors or be made available to them for a fee [15]. These are not merely abstract shortcomings, as tracking can expose scientists to specific and grave danger. From climate change to gender studies or racism: contentious areas of research are putting more and more scholars at risk. In Hungary, the government expelled the entire Central European University for political reasons, and in such cases, tracking information could be used to identify unruly academics to put pressure on them. As their behavioral profiles are tradable, they are open to all interested parties with the necessary funds. For instance, RELX, parent company of academic publisher Elsevier, is selling user data to the US Immigration and Customs Enforcement (ICE) [16].

Workflow monopoly

Additional revenue streams are only one of several reasons the academic publishing corporations deploy tracking technology [17]. Another is to expand their monopoly from research articles to research data and eventually the entire academic workflow. Over the last decade, the four leading publishing houses have all acquired or developed a range of services aiming to develop vertical integration over the entire scientific process from literature search to data acquisition, analysis, writing, publishing and outreach (Fig. 1). User profiles inform the corporations in real time on who is currently working on which problems and where. This information allows them to offer bespoke packaged workflow solutions to institutions. For any institution buying such a workflow package, the risk of vendor lock-in is very real: without any standards, it becomes technically and financially nearly impossible to substitute a chosen service provider with another one. In the best case, this non-substitutability will lead to a practically irreversible fragmentation of research objects and processes as long as a plurality of service providers would be maintained. In the worst case, it will lead to complete dependence of a single, dominant commercial provider. For academia, given the broad reach of such a monopolist, this worst-case scenario would constitute the equivalent of a Microsoft-SAP-Facebook monopoly. In the light of the experience with the scholarly literature, the expected consequences of such a development is that research quality, efficiency, and the free exchange of ideas and data could deteriorate substantially. The independence of universities and public research organizations – both national and EU – could drastically diminish. In that scenario, the current trifecta of crises might come to seem benign in comparison.
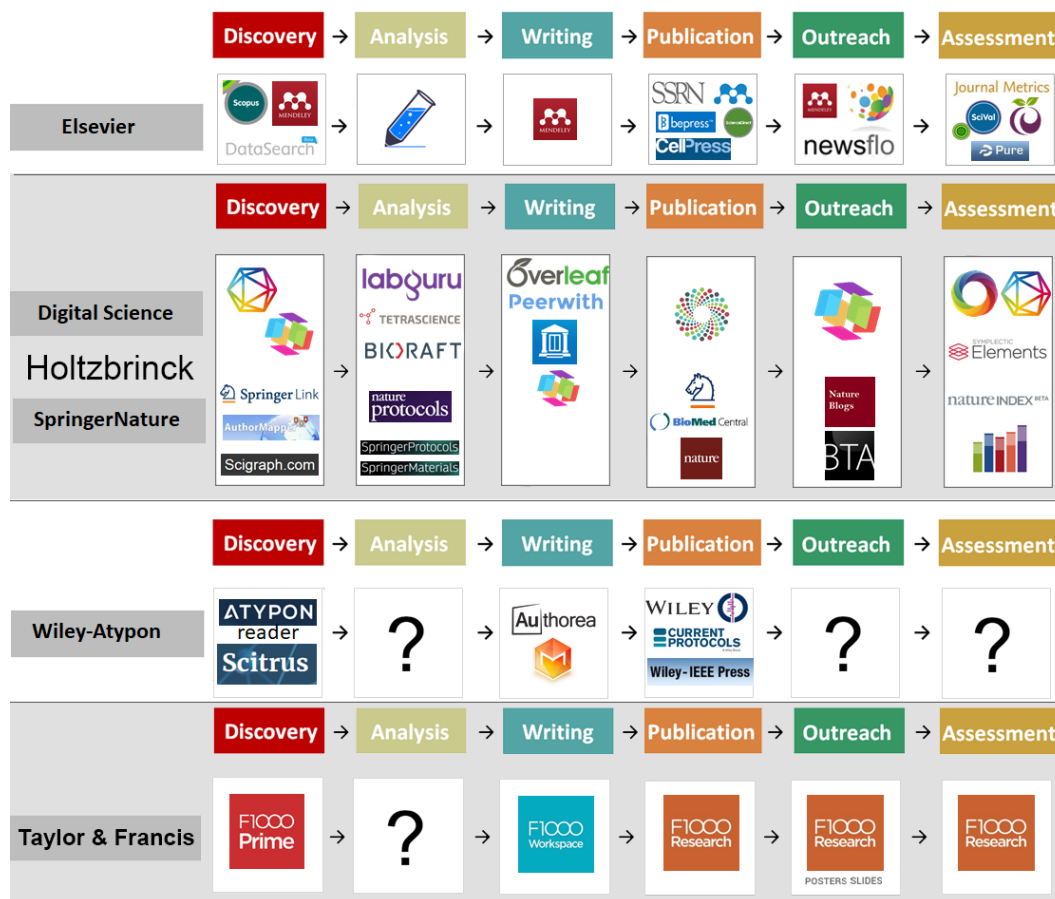
Figure 1: *Providers of digital tools for the scientific workflow.*
Logos stand for software tools designed for specific aspects of the workflow. Each tool may be used in more than one step of the workflow. Elsevier and Holtzbrink are leading in the race to cover the entire workflow, with Holtzbrink offering multiple tools for each step in the workflow. The preconditions for a functioning market exist, but a common standard is missing that provides for the substitutability of service providers or tools. (CC BY: Bianca Kramer, Jeroen Bosman, https://101innovations.wordpress.com/workflows)

Replacement goal

There is now a very real threat of a single (or few) corporations effectively owning all scientific data, both research data and user data, on top of their share of the scholarly literature. Together with the emergence of suitable replacements, this is what now prompts expert after expert to ask for a disruptive break that can pull scholarship out of the locked-in vicious cycle [2-10]. The break will not be technological, as all the technology for the disruption already exists, but with regard to governance. In general, there is broad agreement on the goal for a modern scholarly digital infrastructure: it needs to replace traditional journals with a decentralized, resilient, evolvable network that is interconnected by open standards, that allow seamlessly moving from one provider to another, under the governance of the scholarly community, de-centering the journal article as the

sole scientific output that "counts". Hence, the replacement needs not only to encompass the literature, but all components of the scholarly workflow, with modern technologies taking care of text, data, and code, allowing dynamic updating, version/quality control, and tracking of contributorship. It needs to replace the monopolies connected to the journals with a genuine, functioning and well-regulated market. In this new market, substitutable service providers compete and innovate according to the conditions of the scholarly community, avoiding another vendor lock-in. There is also agreement over the most fundamental requirement for such a replacement to materialize: open standards.

Open standards

In order for the workflow service providers to become substitutable, at minimum, content and services need to be made accessible according to a set of enforced standards which the service providers must adhere to. To prevent commercial monopolization, to ensure cybersecurity, user/patient privacy, and future development, these standards need to be open, under the governance of the scholarly community. Open standards enable switching from one provider to another, allowing public institutions to develop tender or bidding processes, in which service providers can compete with each other with their services for the scientific workflow. A direct consequence of such standards is that the "single source exemption" from procurement rules – the reason for the power of legacy publishers – no longer applies. Freed from this exemption, the EU has established a standard tender process for their publishing platform "Open Research Europe" (ORE). Once that contract runs out, in contrast to the locked-in contracts with legacy publishers today, the EU may hold another tender for the subsequent contract(s). This process shows that it has now become realistic to aim for a journal system replacement that restores the regular procurement processes used in all other domains also to the digital scholarly infrastructure. Analogously, tried-and-tested market regulation mechanisms from other infrastructure domains such as electricity or telecommunications can now be applied also for scholarly infrastructures to prevent monopolization of content and services. There is no more need to reinvent the wheel for open scholarly infrastructures.

The basis for such standards exists [18-26] and only needs to be expanded (e.g., [27], adopted and enforced. Thus, a standards body, analogous to, e.g., the W3C, needs to form under the governance of the scholarly community to allow the development of open scholarly infrastructures servicing the entire research workflow. Such standards, evolving with feedback from the scientific community, would not only serve to make service providers interoperable, they would also bring the means of scholarly communication back under the sovereignty of the scholarly community. As an added benefit, the criteria defined in these standards (i.e., following Open Science and FAIR principles [22-24]) not only allow for the substitutability of service providers but also assist scientists in following guidelines for good scientific practice. Such standards and the open infrastructures they enable thus prevent vendor lock-in, increase price pressure, promote innovation and increase the reliability of science. This replacement goal tackles the trifecta of scholarly crises all at the same time.

Practical implementation

There is no shortage of technical solutions to implement such a replacement, both from the large service providers (Fig. 1) and from start-ups and community initiatives. More than 700 tools and solutions are ready to be implemented [28], once an open scholarly standard has been implemented. There already are independent, non-profit platforms where service providers can be substituted (e.g., Public Library of Science, PLoS; Open Library of the Humanities, OLH or Open Research Central, ORC). The technology differs marginally between them, but only one, ORC, the one where ORE is located, is explicitly designed without journal containers. ORE as well as platforms from other funding agencies and research institutions form components of ORC. Scholarly institutions in general, not just funding agencies, have a long history of publishing the work of their scholars - be it in preprint archives or institutional repositories - and of striving to develop a global library of interoperable repositories [29-32]. Combining these long-standing initiatives with existing open infrastructure developments is now technically feasible. Driven and led by scholars, PLoS developed in the life sciences, OLH in the humanities. The newly established board of ORC now also fulfills the criterion of scholarly governance. Thus, we now have a choice of platforms that can - in principle - be established as a central framework where every institution can host their own content, and just like the EU with ORE, can replace secret negotiations with regular tender processes – tackling the affordability crisis. These bidding processes commonly specify the functionalities of the platforms, tackling the functionality crisis. When they are regulated to be fair and open, market forces have proven time and again to foster innovation, efficiency, and benefit customers by exerting price pressure. This framework would create a completely new market with genuine competition and eliminate the current monopoly conglomerate. Unlike the current system, this market will be easier to regulate, should dominant players arise. Moreover, the new framework needs not only cater to traditional businesses but, being digital, will also encompass more modern forms of service providers on all scales between nonprofit and for-profit. Open source software development has a decades-long tradition in the scholarly community and the new framework, by receiving funds currently supporting the legacy journals, will finally offer sustainable support for it on a global scale (see below).

Infrastructure initiatives such as the European Open Science Cloud (EOSC) seamlessly integrate into the replacement framework due to the shared standards. The granularity of services and providers, package sizes and workflow solutions can be chosen by each institution and their users. Expert users are free to replace institutional components by components of their choice, or develop entirely new custom components themselves. Analogous to how institutions now can substitute one, say, electricity, HVAC or email provider with another one with minimal disruption, providers can in principle be substituted on any desired level of granularity: individual components or large package solutions. This disruptive break would bring the procurement rules of the digital scholarly infrastructure in line with those of the non-digital infrastructure.

Technical advantages

The entire scholarly content can be made available at single addresses, despite the decentralized organization of the underlying, invisible, infrastructure. In that way, both global access to all scholarly content as well as access to sub-sections become conveniently available at any granularity. With the appropriate back-end solution, a large section (i.e., regions, countries, continents) of this decentralized network could go off-line and the remaining nodes would still be able to offer 100% of the content. In addition to this resilience, cybersecurity is increased even further by eliminating the tracking software currently deployed by publishers. Removal of the journal brand as a perverse incentive, together with automated data and code accessibility for scrutiny, tackles the two most important aspects of the replication crisis. Dynamic updating and version control with persistent identifiers allow scholarly outputs to move from a static "version of record" to living outputs which can be rapidly updated to reflect the best available knowledge at any time. New models for tracking of contributorship and provenience will complement or even replace traditional authorship and help establish credit for valuable scientific activities not traditionally counted, such as generating and managing research data, peer reviewing, brainstorming hypotheses, or incremental improvements to open software (e.g., using the CRediT standard [26]). Improved peer-review functionalities such as direct author-reviewer interactions, peer-review aimed at all research output and not just narratives, transparent review, computer-assisted peer-review, and flexible anonymity and pseudonymity solutions contribute to more efficient quality control. Layered reputation systems for both research objects and users further support the trustworthiness of research objects and researchers. Visual interfaces, semantic search and content mining solutions not only save researchers time and improve the quality of the discovery process, but also allow software agents to derive novel hypotheses by analyzing vast data networks with machine learning algorithms – a task no human would be able to do in a lifetime. All of these data and tools can fuel novel augmented intelligence systems, where artificial intelligence is combined with human intelligence to facilitate large-scale scientific collaboration.

From improving essentially every single process in which scholars interact with their topic of study to machine learning-derived hypotheses, there are no downsides to replacing antiquated journals with modern technology. While the journal replacement cannot be a panacea, it will at least come with the tools and prerequisites to help mitigate researchers' all too human tendencies to cut corners, tell stories or cheat, in contrast to the journal system which has proven time and again to always exacerbate these traits.

Funding redirection

While a standards body under the governance of the scholarly community still remains to be formed, technically there do not seem to be any major hurdles for replacing journals. However, one crucial question remains that has not yet been settled, and it is not a technical, but a social or political question: with everybody locked-in, who is to act in which way to ensure the redirection of funds from the legacy system to the replacement solution, i.e., an open scholarly infrastructure?

Historically, funding agencies have ensured minimum standards at funded institutions by requiring specific infrastructures. Some funding agencies have expanded these eligibility criteria to also include criteria for good scientific practice, such as the German DFG [33]. Along the same veins, funding agencies have recently started to also include institutions' evaluation procedures in their eligibility criteria. Wellcome or Templeton World Charity Foundation are leading the way by refusing to fund applicants at institutions that evaluate researchers by the journals they publish in [34, 35]. One does not need to completely exclude institutions from funding to incentivize change. For instance, in Finland's national funding model for universities, certain openly accessible research objects weigh 20% higher than legacy objects [36]. With open research practices becoming more and more commonplace [37], such and analogous incentives for institutions to provide an infrastructure that not only supports these practices across the board but simultaneously addresses the most pressing scholarly problems, is just common sense. Updating such funder guidelines and criteria to reward the redirection of funds towards open infrastructure components that tackle the three crises and, at the same time, disincentivize maintenance of funding for the legacy infrastructures that are fueling the crises, would help realign the financial incentives for institutions with public and scholarly interest.

Ownership involves socially recognized economic rights, first and foremost the exclusive control over that property [38], with the self-efficacy it affords. The inability to exert such control over crucial components of their scholarly infrastructure in the face of a generally recognized need for action for over three decades now, evinces the dramatic erosion of real ownership rights for the scholarly community over said infrastructure. Thus, this proposal is motivated not only by the now very urgent need to restore such ownership to the scholarly community, but also by the understanding that through their funding bodies, scholars may have an effective and proven avenue at their disposal to identify game-changing actions and to design a financial incentive structure for recipient institutions that can help realize the restoration of ownership, with the goal to implement open digital infrastructures that are as effective and as invisible as their non-digital counterparts.

References:

[1] https://youtu.be/DhIEkq2PSF0?t=1325

[2] http://blogarchive.brembs.net/comment-n137.html

[3] https://evidenceandreason.wordpress.com/2019/10/26/how-might-science-benefit-from-a-world-without-journals/

[4] http://jon.smajda.com/2010/01/07/post-journal-academic-publishing/

[5] https://www.linkedin.com/pulse/applying-theories-disruption-change-scholarly-journal-monique-lamine/

[6] https://www.openuphub.eu/community/blog/item/the-revolution-will-not-be-paywalled

[7] https://asapbio.org/fix-incentives

[8] https://researchwhisperer.org/2021/06/22/open-access-at-no-cost

[9] https://doi.org/10.1371/journal.pbio.3000117

[10] https://doi.org/10.1371/journal.pbio.3000116

[11] https://www.frontiersin.org/articles/10.3389/fnhum.2018.00037/full

[12] https://doi.org/10.12688/f1000research.27468.1

[13] https://www.liberquarterly.eu/articles/10.18352/lq.10280

[14] https://ruor.uottawa.ca/bitstream/10393/42327/1/Open_access_journals_and_article_processing_charges_2011_2021_preprint.pdf

[15] https://www.dfg.de/download/pdf/foerderung/programme/lis/datentracking_papier_en.pdf

[16] https://theintercept.com/2021/04/02/ice-database-surveillance-lexisnexis

[17] https://zeitung.faz.net/faz/geisteswissenschaften/2020-12-02/3a45541d53e23d3ae2cbea2c3e6a0af1/?GEPC=s9

[18] https://www.niso.org/publications/z3996-2019-jats

[19] https://www.niso.org/publications/rp-31-2021-badging

[20] https://www.niso.org/publications/niso-rp-8-2008-jav

[21] https://elifesciences.org/for-the-press/2b653a68/elife-and-stencila-announce-roadmap-for-bringing-reproducible-publishing-to-more-authors

[22] https://www.go-fair.org/fair-principles/

[23] http://opendefinition.org/

[24] https://opencitations.net/model

[25] https://jats4r.org

[26] https://credit.niso.org

[27] https://educopia.org/nglp-releases-lib-pub-infrastructure

[28] https://docs.google.com/spreadsheets/d/1KUM-Seq_Pzp4KveZ7pb5rddcssk1XBTiLHniD0d3nDqo/edit#gid=0

[29] https://doi.org/10.1007/s11192-010-0253-1

[30] https://www.openarchives.org

[31] https://www.coar-repositories.org/news-updates/what-we-do/next-generation-repositories

[32] https://educopia.org/next-generation-library-publishing

[33] https://www.dfg.de/foerderung/grundlagen_rahmenbedingungen/gwp

[34] https://wellcome.org/grant-funding/guidance/open-access-guidance/open-access-policy

[35] https://www.templetonworldcharity.org/research-assessment-policy

[36] http://urn.fi/URN:ISBN:978-952-263-600-3

[37] https://doi.org/10.1038/d41586-021-01824-z

[38] https://www.jstor.org/stable/29737683