

Expanding academic publishing practices alongside the digital turn

A discussion paper by the »Scientific practice« working group of the Priority Initiative »Digital Information« by the Alliance of Science Organisations

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Contents

Background of this paper	4
Core statements	5
The expansion of academic publishing practices	7
Indications of an expansion of academic publishing practices	8
New digital publication formats as independent scientific achievements	10
Development needs	11
Appendix	13
Imprint	14



Background of this paper

The Priority Initiative »Digital Information« by the Alliance of Science Organisations commissioned the working group »Scientific practice« to try and understand how digital technologies can support and change the growth of scientific knowledge, its reproducibility and the accessibility of said knowledge.

The digital turn manifests itself in many different shapes and sizes, depending on the community, and it can progress at different speeds. An expert discussion with representatives from different academic communities was organised by the working group to establish the potential, hurdles and needs resulting from the digital turn with respect to the academic practice of publishing. The expert discussion mainly focused on publication formats which have arisen from and continued to develop in the context of digitalisation efforts within these communities. »Format«, in this instance, refers to printed publications such as articles, monographs, and anthologies, even in digital form. It also includes data, software, codes, videos, models, test suites, blogs, social media communication and much more. In the discussion, the applications and requirements of the new publication formats were described in precise terms. The working group received statements and evaluations on the preconditions for the future success of certain formats, taking into consideration aspects such as the availability of specialised staff, quality assurance processes, incentives for using formats and infrastructure requirements.

The working group prepared this discussion paper following the expert discussion. Since it did not seem practicable to reproduce the points of view of the individual disciplines, the working group aimed at producing a meta-reflection on *the expansion of academic publishing practices alongside the digital turn*. Considering digitalisation has progressed to different degrees in the different disciplines, the group decided to look out for cross-disciplinary or particularly striking trends. In this respect, the primary objective was a general description of the phenomenon. This paper attempts to open a horizon for reflection, which makes visible both the potential and the obstacles of the current and future practice of academic publication. The working group believes that exploiting this potential essentially depends on the general acceptance and discipline-specific formulation of clear criteria for *the recognition of different digital publication formats as attributable and remunerable scientific practice of the type »publishing«*. In other words, this should be an independent academic publication effort.

Core statements

- ♦ Printed publications have been considered the sole publishing objective of research for centuries, documenting its progress and results. As digital change progresses, these traditional formats of publication increasingly lose their exclusivity. A myriad of other publication formats, sometimes using a variety of media, have sprung up.
- ♦ This has resulted in the expansion of the academic practice of publication to also include those stages of the research process which used to be pre-publication as well as in an increasing diversity of media used for publication formats.
- ♦ This is partly due to the fact that the digital turn opens up more opportunities to be more public than ever before. The results of stages of the research process which used to be exclusively pre-publication, and which used to be exchanged informally at best and were thus considered no more than a precursor or a by-product of the final publication, is taking up more and more space. While the practice of academic publication had previously been geared towards traditional print publications with the preceding stages either going completely unseen or only being visible to a small extent, these preceding stages are now giving rise to their own, increasingly independent publication formats with a claim to equal value.
- ♦ The distinction between different publication formats is changing the chronological order of, and linkages between, individual stages of research. Even stages which used to be pre-publication can now produce publications (e.g. data publications) before an article or monograph is published. With the rise of the data sharing culture, there will be more and more network-shaped bifurcations between the output of these former pre-publication stages and the traditional formats used for the publication of results. For instance, a traditional publication may become obsolete, while a publication from a precursory step in the research process remains valid.
- ♦ Digital publication formats have revealed traditional print publication to be a mere portion of a dynamic process which comprises an array of formerly pre-production stages, the publications they resulted in as well as other print publications. Digital outreach formats (e.g. in social media) can be added to this array, to allow scientists and research institutions to publish their ongoing research processes as well as the final research results.

- ◆ Expanding the concept of publication to include formerly pre-publication stages begs the question to what extent the resulting output should be considered an independent scientific effort – as an attributable and remunerable academic practice of the type »publishing«. This raises the question for all scientific communities of what is and what should be considered a scientific publication (with or without quality standards) in their own fields in the context of digitalisation, and how to distinguish publications from other forms of science-related communication. This allows for new digital formats to be acknowledged as independent scientific achievements, or for their use as a basis for other scientific applications and commercial purposes.
- ◆ The unclear status of formerly pre-publication stages and of their resulting publications bears undesired consequences for the development of science because it gives rise to uncertainties within academia. A lack of standards for formats, unclear quality assurance processes, ambiguous rules for remuneration, insufficient infrastructure and a lack of qualified personnel impede the development of high-quality research.



The expansion of academic publishing practices

Publishing – generally understood as the practice of using media to make content publicly available – has been a key scientific practice for centuries. It is embedded in a complex system of rules, conventions and routines and serves the system of science in various ways, emerging through collaboration between various players from science, infrastructure and the public as well as commercial sectors. Publishing is here regarded as a systemic academic practice that has been influenced for several decades by profound changes in media and cultural history which can be understood as the digital turn – commonly known as digitalisation. Over the last few years, the transformation of scientific publication has been accelerating due to digital change. This acceleration goes hand in hand with an expansion of publishing practices to include those stages of the research process which traditionally come before a printed publication and whose products generally were not previously made public, or only to a very limited extent. This makes the scientific practice of publishing more extensive, and at the same time more differentiated.

However, the depth, range and speed of the digital turn vary from one discipline to the next, with different consequences for the corresponding practices of publication. Web-based and open-access preprints have been common for a long time in some disciplines, and others have been exchanging research data and software for decades – usually through informal networks. In other disciplines, printed publications have simply been supplemented by the addition of digital formats (usually PDF files). Finally, a growing number of disciplines have started publishing new types of content, such as research data or software.

Regardless of the specific characteristics of a particular discipline, the academic system as a whole is undergoing a fundamental expansion regarding practices of publication (in part initiated and in part forced by the digital turn). As a consequence, a distinction is being made between different scientific publication formats. All scientific organisations and disciplines – whether they work independently or in collaboration – are tasked with reflecting on this expansion from the point of view of epistemology, infrastructure and its consequences, for instance for purposes of academic quality assurance and remuneration systems, and to shape it accordingly.

Indications of an expansion of academic publishing practices

Within the scientific community, these changes in academic publishing practices are being accompanied by discussions about the very concept of publication, about its potential for making research processes more visible and about how to enable better communication. This also explicitly refers to the research process itself. In our view, the following developments, among others, lead to a change in the traditional understanding of what scientific publications are:

- ◆ The most important change is the expansion of the practice of publication to include formerly pre-publication stages of the research process described above. If the output is edited and published according to scientific conventions, this leads to a marked *differentiation between different publication formats* (e.g. research data, research software), which may go hand in hand with a distinction between each publishing function.
- ◆ In many disciplines, the ongoing differentiation between various formats is being accompanied by discussions about *integrative formats*, which either blend different media to create *multimedia formats* or to combine formats created during different phases of the research process – such as research data, research software and research results – to construct hybrid formats. One commonality amongst the formats which are being discussed here (and which have already been tried out in some disciplines) is that they dismantle the *homogeneity of traditional publication* regarding mode and media.
- ◆ Wherever the potential of *dynamic formats* (in the sense of living documents) is pondered and tested, the *finality of traditional publications* is considered challenging. Dynamic formats may have temporary final versions in the shape of numbered versions. They respond to the fact that research is in itself a process. Publications themselves are also conceived of as processes, which has a far-reaching effect on the scientific convention of referencing.

- ◆ Science communication – or, put differently, communication about academic practice and findings to a wider audience – has given rise to many new publication formats, some of which combine with academic publication formats to build *digital outreach formats*. Researchers can use these formats – ranging from websites and blogs to social media platforms such as Twitter – to provide information about their research and publicly communicate concrete research practices. Scientists and their organisations are becoming – or making themselves – more public in a new and more extensive manner.




New digital publication formats as independent scientific achievements

The fact that today, research processes can become public to an unprecedented extent, merits particular attention. In many disciplines, the academic practice of publishing has already been extended to include those stages of research processes whose results and products were previously deemed to be *pre-publication*, and which are only now being considered worthy of publication, or whose publication has only just become technically possible. This has triggered changes in the evaluation of research processes: Something that used to be visible only to a limited extent – or not at all – until the final version was printed is increasingly being recognised as an independent scientific achievement, or as a basis for further scientific applications or commercial use. In other areas (e.g., drug development), there are already – sometimes statutory – regulations requiring the data on which a printed publication (such as an article) is based to be accessible for independent scrutiny.

The extension of the practice of publication to include formerly pre-publication stages of the research process has consequences on the spectrum of scientific publication formats, leading to a considerable number of different formats: Articles, monographs and similar, traditional formats of scientific publication are no longer the sole telos for publishing a research process. On the contrary, many elements of what used to be created for the sole purpose of internal documentation are now being published (digitally).

This development also bears the possibility of making science more accessible in line with the ideas of open science by increasing the transparency, replicability, speed and openness of the research process. Furthermore, digital formats can help to accelerate the communication of research processes and results to relevant communities and beyond, even before a final printed publication is available.



Development needs

The expansion of academic practices of publishing and the corresponding differentiation between various publication formats in the wake of the digital turn require the advancement of traditional rules, routines and conventions as well as infrastructures of scientific publishing. Depending on the format and/or discipline, we need to

- a) expand suitable publication platforms,
- b) develop standards for the publication of new formats,
- c) organise quality assurance processes,
- d) modify remuneration mechanisms,
- e) clarify legal questions and
- f) train and recruit specialised staff.

We need to consider the intrinsic logic of digital publication practices, so that solutions (for example for quality assurance) are not merely copied from those applied to classical publications. In view of the expected surge of publications, options for navigation, filtering and selection spanning all disciplines and formats need to be established, with communities bearing responsibility for developing appropriate infrastructures and criteria. In this connection, we need to critically reflect on the fact that private corporate players (such as Microsoft's GitHub for research software) have taken on infrastructural functions within the scientific system. The potential of a non-commercial infrastructure developed and controlled by the communities themselves (such as Arxiv) should be exploited more heavily to strengthen the independence of science.

The extension of academic practices of publishing to include formerly pre-publication stages of the research process has given rise to higher expectations of these stages, which could be seen as further professionalisation and regulatory control. Above all, it necessitates the targeted training and long-term employment of specialists. We should not forget that the digital turn is giving rise to very specific digital formats in some disciplines which require bespoke solutions. At the same time, we



can also identify formats which can be used across disciplines and for which generic solutions (including infrastructures) should be developed. Particular attention should be given to the fact that interdisciplinary research requires a coordination of developments, particularly with respect to the National Research Data Infrastructure (NFDI).

The goal is to exploit the scientific, cultural, and economic potential of academic practices of publishing, and to support the cultural changes which are already under way – but for which we currently lack an appropriate framework. Wherever the digital turn's innovation potential for publishing is being tested, the workload often lies solely with the scientists. Only few disciplines have already introduced an appropriate infrastructural safeguard for long-term availability. Furthermore, there is a lack of standards – not just for the heterogeneous and sometimes dynamic publications, which often lack conventions and stable rules, but also for review processes in general. Ultimately, we must acknowledge that the status of non-traditional publication formats as an academic effort worthy of recognition is not yet widely secured. What we need are new, differentiated rules, conventions, standards, and accountabilities to tap into exploit the potential of high-quality academic publication practices in the digital age.



Appendix

Information on the expert discussions

Date: 30 September – 1 October 2019

Place: German Rectors' Conference (HRK), Ahrstraße 39, 53175 Bonn

Presenters

- ◆ Prof. Dr. Eberhard Bodenschatz, Physics
Max Planck Institute for Dynamics and Self-Organization, Göttingen
- ◆ Stephan Druskat, Linguistics and Computer Science
Humboldt-Universität zu Berlin and German Aerospace Center (DLR)
- ◆ Prof. Dr. Konrad Förstner, Bioinformatics
Technische Hochschule Köln, ZB MED
- ◆ Prof. Dr. Frank Oliver Glöckner, Life Sciences
Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research
Bremerhaven & University of Bremen
- ◆ Prof. Dr. Friederike Fless, Archaeology
German Archaeological Institute, Berlin
- ◆ Prof. Dr. Bernhard Nebel, Computer Science
University of Freiburg
- ◆ Prof. Dr. Regine Riphahn, Economics
Friedrich Alexander University Erlangen-Nürnberg
- ◆ Prof. Dr. Christof Schöch, Digital Humanities
University of Trier
- ◆ Dr. Beate Wieseler, Medicine
Institute for Quality and Efficiency in Health Care, Cologne

Other participants

- ◆ Prof. Dr. Diethard Tautz, Life Sciences
Max Planck Institute for Evolutionary Biology in Plön
- ◆ Dr. Angela Holzer
German Research Foundation, Scientific Library Services and Information
Systems

Imprint

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