OPEN SCIENCE.
OPEN ACCESS – OPEN DATA – OPEN SOURCE
POLICY AND IMPLEMENTATION

Already in 2003, the Volkswagen Foundation signed the "Berlin Declaration on Open Access to Knowledge in the Sciences in the Humanities"[1]. The short text stated a "vision of a global and accessible representation of knowledge" which can be implemented as the new communication medium in the research with the help of the internet. Two decades later, Open Access is embedded in an overall concept which accounts for the digital revolution with its reciprocal effect of continuously more efficient storage media, continuously larger quantity of data and continuously more effective software programs in all parts of the scientific system. At the same time, it formulates the demand that knowledge as a common good of humanity needs to be made freely available to everybody. Within the scientific system, Open Science in turn is the prerequisite for the reproducibility of scientific results, which itself is a basic pillar of the trustworthiness of research, ultimately the condition for science actually.

With its policy defined in November 2021, the Volkswagen Foundation pursues the target to encourage the concept of Open Science in its funding. The Foundation considers itself to stand by the side of "its" grantees in this very dynamic transformation process of data intensive science. It will also adapt its position continuously as for a number of technical, legal, institutional as well as political framework conditions of Open Science the final decisions are still pending.
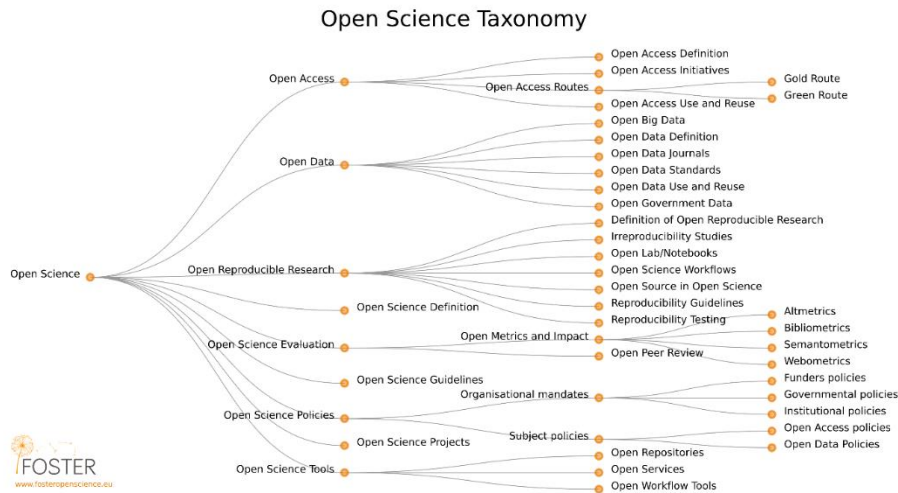
OPEN SCIENCE

The Volkswagen Foundation supports the concept of Open Science in its funding programs. It takes as basis the definition of the UNESCO: Open Science is defined as an "inclusive construct that combines various movements and practices aiming to make multilingual scientific knowledge openly available, accessible and reusable for everyone, to increase scientific collaborations and sharing of information for the benefits of science and society, and to open the processes of scientific knowledge creation, evaluation and communication to societal actors beyond the traditional scientific community."[2] The scope of the overall concept is made clear in the Open Science Taxonomy:

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[1] https://openaccess.mpg.de/Berliner-Erklaerung [25.2.2022]
[2] UNESCO Recommendation on Open Science 11/2021.
  (https://unesdoc.unesco.org/ark:/48223/pf0000379949.locale=en) [25.2.2022]

Open Science Taxonomy

The Volkswagen Foundation here supports the methodological approach of "open science by design", meaning the open design of the whole research process from the very beginning; "open science by publication" as subsequent transfer of scientific results in the open world is only second best.

In its support of Open Science, the Volkswagen Foundation counts on incentives and not sanctions or bans. Part of this is the support of scientific recognition of Open Science achievements in the whole funding process: starting from the application process, as context of the review and decision process up until the monitoring in the project. At the same time, it tries to counteract problematic developments in the scientific system as part of the ubiquitous built-up of data intensive science. In January, the Volkswagen Foundation signed the "San Francisco Declaration on Research Assessment"[3] (DORA).

At the center of its actions, there are currently the three central Open Science components: Open Access, Open Data and Open Source (Open Science Tools). In all three areas, the development is highly dynamic, however, at different stages of development at the moment. It is apparent that all three digital objects will become part of one joint digital eco-system in the near future.

OPEN ACCESS

The term Open Access describes the access to full text versions on the internet, directly and free of costs – citable, peer reviewed and in a version of record. It is apparent that Open Access will prevail sooner or later over subscriptions models (print as well as digitally available, licensed publications as well as eBooks). Knowledge disseminated via open access can very quickly be taken up by researchers. At the same time, citation rates will most likely increase, which will make this type of publication also attractive for individual researchers in the academic

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[3] https://sfdora.org/read/ [25.2.2022]]

competition situation. Additionally, the digital tracing of the state of the art in research with the help of text mining and the newest scientific development will play an ever-increasing role due to the growth of scientific publications. The percentage of Open Access publications in Germany indeed grows, with the exception of monographs of trade publishers (Trade Books) focusing on the broader public. This is the case even though one should point out that the original hope of the scientific system to counteract the pursuit of profit of the major commercial publishing houses with Open Access did not fulfill itself. At the same time, the diversity of publication habits in the disciplines and the national publication markets need to be considered.

The leading concept of the Volkswagen Foundation here is that research results generated within funded projects should preferably be published Open Access. Concurrently, the grantees should also derive maximum academic credit for doing so. In this respect, the Volkswagen Foundation aims to support its funded researchers in their selection of the ideal type of publication for their project results.

Steps taken

- The Volkswagen Foundation encourages its grantees in the grant letter to publish their results Open Access. To do so, it covers as publication cost contribution the Article Processing Charges (APC) and the Book Processing Charges (BPC) asked by the publishing houses without a cap.
- The Foundation only supports print publication in subscription models and the renunciation of Open Access in justified cases (e.g. Trade Books, or due to image copyrights etc.). Printed conference transcripts are not fundable.
- Applicants are asked to mark their Open Access publication specifically in their CVs for the review and decision process. The same applies for the project report at the end of the funding period.
- Researchers are encouraged to reserve for themselves a non-exclusive right of use for electronic publication of project results (Volkswagen Foundation funded) in their publication contracts for the purpose of continuously free use.
- In order to enable cost transparency in the field of APC/BPC, the Volkswagen Foundation supports the publicly funded organizations with data transfer, e.g. the Open Access Monitor.

It is recommended to consult experts in the field (university service offices, library service offices etc.) for the fitting selection of Open Access publication medium as well as for help with contract related questions. With Open Access articles, one should consider only journals listed in the Directory of Open Access Journals (DOAJ)[4]; with monographs, one should select publishers which are listed in the Directory of Open Access Books (DOAB)[5] or are members of

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[4] https://doaj.org/ [25.2.2022]
[5] https://doabooks.org/ [25.2.2022]

the Open Access Scholarly Publishing Association. A change to Open Access often requires researchers to consider their copyright in the publication process and have a certain cost awareness.

OPEN DATA

Research data is at the same time the basis and the result of research. Its longterm storage and supply enables scientific progress as well as keeping up quality standards due to replicating data. The concept of Open Data focuses on the "open" handling of research data as an important resource of science and the humanities. Open Data asks for the commitment to the so-called FAIR principles – data needs to be findable, accessible, interoperable and reusable, for humans as well as machines[6]. The same is valid for the CARE principles ("Principle of Indigenous Data Governance"[7]). In the field of research data, however, there is quite a large heterogeneity among the different disciplines, when it comes to data annotation, data processing and data storage. For example, in the field of high-energy physics many processes are already clearly defined, while in other disciplines, standards are still being fought over and routines need to be established. In these disciplines, a data management plan (DMP) is an important instrument. Still, the big challenge is the overall scientific system. The National Research Data Infrastructure (Nationale Forschungsdateninfrastruktur, NFDI) pursues the goal to build up a reliable and sustainable infrastructure for research data, mid-term and longterm. At the same time, there are still a number of technical, field-specific and structural questions in this highly complex coordination process that need to be answered. A consolidation and permanent adoption is even more necessary as research data needs to be migrated in the Data Duration Cycle every two to three years.

The leading concept of the Volkswagen Foundation is that preferably research data generated within funded projects should be made openly available and that, concurrently, the data-generating researchers get the maximum academic credit for this.

Steps Taken
- The Volkswagen Foundation encourages researchers to store the data generated within funded projects in public, non-commercial repositories, so far as they are/can be relevant for future research.
- The Volkswagen Foundation provides additional funds for the preparation of generated research data (Data Reuse) for funded projects.
- In the application process, data generating and data using projects working in disciplines lacking a clear data workflow are asked to upload a digital concept

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[6] Wilkinson, M., Dumontier, M., Aalbersberg, I. et al. (2016): The FAIR Guiding Principles for scientific data management and stewardship. Sci Data 3, 160018. https://www.nature.com/articles/sdata201618 [25.2.2022].

[7] https://www.gida-global.org/care [25.2.2022]

with a data management plan (DMP). In the case that the intended repository is already decided upon, its DMP should be used. If not, a basic DMP needs to be uploaded. It is recommended that in any case the DMP is considered as a living document of a digital concept and to resolve at an early stage, which is the target repository.

- Furthermore, it is recommended, that in cooperation projects the data rights of each project member should be defined from the start.
- In the application process, the applicants are asked to mark separately the already generated Open Data in the CV for the review and decision process. The same applies for the final project report.

It is recommended to consult experts in the field (professional societies, university service offices, repositories etc.) for the fitting selection of target repositories as well as the filling out of the DMP and the various legal questions connected to using external data and the allocation of personal data access. An overview over the already existing repositories is provided by the directory of research data repositories re3data (https://www.re3data.org/) as well as the DFG-Portal for research infrastructure RIsources (https://risources.dfg.de/).

Furthermore, it is recommended to follow the current and future development in the field of research data processing.

OPEN SOURCE

The development in the field of Open Source – in some concepts this is also subsumed as "procedural research data" under Open Data –is legally and technically the most indistinct at the moment. It needs to be stated that software is not a "by-product", but an integral part of research itself. Its importance lies in the fact that it basically models our world. The FAIR principles also apply to Open Source challenging the participating repositories technically. Moreover, the legal level is complex, for institutions as well for the individual researchers. In the academic world as in the business sector, Open Source is used frequently in the highly dynamic development of software due to the community effects. A system of differentiated licenses for source code enables the use of Open Source for the protection of intellectual property rights. The individual researchers have to learn to reasonably protect their interests against the business sector in the coming years[8]. Concurrently, to use software components without authorization can cause severe problems. Furthermore, liability questions connected to Open Source are still an unsolved legal problem.

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[8] Very often a strict separation of the academic and the business world is not required. The British Eclipse Foundation pursues the mission "to collaborate on commercially friendly open source". https://www.eclipse.org/org/foundation/ [25.2.2022]

The leading concept of the Volkswagen Foundation here is that Source Code generated within funded projects preferably is to be made available to other researchers and that, concurrently, the producing researchers should get the maximum academic credit for doing so.

Steps taken

- The Volkswagen Foundation encourages the grantees to make the source code generated within funded projects openly available and to store them in public, non-commercial repositories.
- In the application process, the applicants should separately mark the open source generated by them in their CVs for the review and decision process. Concurrently, this also applies to the final project report.
- It is possible to found spin-off companies from funded projects as startups when the income will be distributed into the scientific system (see Funding Principles, subitem 16)

It is recommended to consult experts (from repositories, university service offices, etc.) when it comes to licensing the own code as well as when using external code components.

Concurrently to building-up Open Science, efforts are made to implement data literacy in schools and university training. Data Sciences is meant to become a new and important field of action, in which the researcher can get academic credit for his or her scientific career. The Council of Information Infrastructure (RfII) points to the urgent need for action in this field in its document "Digitale Kompetenz - dringend gesucht! Empfehlungen zu Berufs- und Ausbildungsperspektiven für den Arbeitsmarkt Wissenschaft" (2019)[9].

NEXT STEPS

The field of Open Science is so dynamic that many developments, topics and questions are only beginning to show. The Volkswagen Foundation, therefore,
provides an open space for projects which want to find and test possible solutions, for example in the important but difficult replication studies. Additionally, ethical questions in the context of Open Science can be further analyzed.

These kind of ideas can be further developed within the funding offer "Pioneer Projects – Impetus for the German Research System" [https://www.volkswagenstiftung.de/en/funding/our-funding-portfolio-at-a-glance/pioneer-projects-impetus-for-the-german-research-system].

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[9] https://rfii.de/download/digitale-kompetenzen-dringend-gesucht/ [25.2.2022].

As part of future observation, the Volkswagen Foundation will also include further concepts of the Open Science Taxonomy in its activities besides Open Access, Open Data and Open Science.