



Open Science Roles for Libraries: International Perspectives and Examples

Vloge knjižnic v odprti znanosti: mednarodni vidiki in primeri

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Izveleček

Namen: Pregled pomena odprte znanosti za knjižnice v kontekstu širšega odprtega gibanja z mednarodnimi vidiki in primeri iz nacionalnih, visokošolskih in splošnih knjižnic.

Metodologija/pristop: Predstavljena je kvalitativna sinteza najnovejše literature in spletnih virov.

Rezultati: Posebna pozornost je namenjena potrebi po odprtih knjižničnih infrastrukturah, podpori občanski znanosti, komuniciranju odprte znanosti in knjižnicam kot demonstratorkam odprtih tehnologij. Avtorji predlagajo, da so knjižnice v dobrem položaju za podporo in spodbujanje gibanja za odprto znanost, vendar je treba upoštevati praktična vprašanja politik in virov ter filozofske vidike odprtosti.

Omejitve raziskave: Pregled literature je selektiven namesto izčrpen, večina gradiva pa prihaja iz Evrope in Severne Amerike.

Izvirnost/uporabnost raziskave: Pregled je namenjen v podporo knjižničarjem pri realističnih razmislekih o priložnostih, ki jih ponuja gibanje za odprto znanost.

Ključne besede: Odprta znanost, Odprto gibanje, knjižnice, pregled

Podatkovni set: Vsebina prispevka ne temelji na raziskovalnih podatkih.



Abstract

Purpose: To give a review of the significance of Open Science for libraries in the context of the wider Open movement, with international perspectives and examples from national, academic, and public libraries.

Methodology/approach: A qualitative synthesis of recent literature and web materials is presented.

Results: Particular consideration is given to the need for open library infrastructures, support for Citizen Science, Open Science communication, and libraries as demonstrators of open technologies. It is suggested that libraries are well placed to support and promote the Open movement, but that practical issues of policy and resources, as well as philosophical aspects of Open movement, must be considered.

Research limitations: The literature review is selective rather than comprehensive, and most material comes from Europe and North America.

Originality/practical implications: The review should help librarians find a realistic appreciation of the opportunities offered by the Open Science movement.

Keywords: Open Science, Open movement, libraries, review

Dataset metadata: No research data are associated with this article.

1 Introduction

Open Science is a very broad concept, expanding well beyond the natural sciences, and is a part of a still wider and more general *Open* movement. This includes open access, open source, open data, open textbooks, open peer review, open educational resources, and much more. This is a large and exciting topic, and it appears that there should be many opportunities for libraries of all kinds to become involved. But the very breadth of the topic may cause difficulty in establishing what exactly is the best and most helpful contribution that libraries can make. What can libraries do in this area? What should they do? In this paper we outline some answers to these questions, by providing international perceptions and examples, after examining the scope of the Open movement, and some of its practical and ethical considerations.

First, we summarise the Open movement, and Open Science within it, to show some of its main implications for libraries and librarians; both advantages and opportunities, and some problems and potential ethical issues

Four main themes for the practical involvement of libraries of all kinds in Open Science are then considered in more detail, with specific international examples used as illustration. They are:

- the maintenance of an Open infrastructure (particularly repositories and open source software), in which libraries are already heavily involved
- the role of libraries of various kinds as focuses for, and facilitators of, citizen science projects
- the role of libraries as a conduit for open science communication to the public; in particular, countering social media dissemination on issues such as COVID-19 and climate change and providing a realistic framework for the frequent exhortation to the general public to “do your own research”
- the role of libraries as demonstrators for new open technologies by applying them to their own collections.

A set of open access resources are given in support of the points made to allow readers to investigate them further. This is, of course, only a selection from the extensive literature of the topic. For a thorough scoping review of Open Science and citizen science in European libraries to 2023, see Kaarsted et al. (2023); for a systematic review of the engagement of academic libraries in Open Science, see Liu and Liu (2023); and for a scoping review of worldwide health library involvement in Open Science, see Giustini et al. (2021).

2 The Open movement, Open Science, and libraries

The Open movement is very broad, includes a variety of elements and changes in nature and scope over time with changing technologies, and with changing social and economic factors. It eludes a precise and lasting definition and is best understood as “a continuing trend towards an open exchange of information and innovation” (Chalmers, 2012) and as a movement which “seeks to work towards solutions of many of the world’s most pressing problems in a spirit of transparency, collaboration, re-use and free access” (Open Data Handbook, 2023). The origins of the Open movement may be traced back several decades to the first distributions of open source software in the 1950s (Nduta, 2023), but it came to prominence from the 1980s onward. The COVID-19 pandemic focused renewed attention on the value of Open Science and of open digital resources (Mićunovic, Rako, and Feldvari, 2023; Marshall et al., 2024).

Best known of the components of the Open movement are open access to formally published documents of all kinds, open source software, open educational resources, and open data, the last generally associated with the FAIR (Findable, Accessible, Interoperable, and Reusable) data principles (“Fair data”, 2024; LIBER, 2020, 2023). But there are many other sides to Open, including open notebooks (in the sense of scientific laboratory notebooks), open peer review for

academic articles, open methods for research, open culture (giving access to materials in galleries, archives, and museums), open metrics (being open about the way research is judged through counts of publications and citations, and through altmetric indicators), open design, open government, and more. Even the long-standing debate about open plan workplaces, and whether they help or hinder open and effective communication, is still active in the library sector (Bell, 2023; Farkas, 2023). A LibGuide from Framingham State University in Massachusetts, USA, gives a good overview, with helpful definitions and resources for the various open elements (Framingham State University, 2023); see Ackermann (2023) for thoughts on the current status of, and concerns about, open source software and Pinfield (2024) for a similar analysis of open access. Figure 1 depicts an idea of the scope of the open movement.



Figure 1: *Open Science - Open Culture. Katja Mayer. (Licensed under a Creative Commons Attribution 4.0 international license)*

Within the wider Open movement, Open Science, itself a broad concept, deals with openness in the research process, usually but not wholly in the context of the physical and biological sciences. It may be understood most simply as “open research and open scholarship in all disciplines ... a different way of pursuing scholarship [which] brings to the fore the values of collaboration and sharing” (Ignat and Ayris, 2020). It is suggested that its benefits are that “[o]pen science ensures that science is made as accessible as possible for the benefit of science,

the economy and society at large while international cooperation contributes to tackling global challenges effectively” (European Commission, 2024). The actual societal impact of open science has proven difficult to verify; see a scoping review (Cole et al., 2024) from PathOS (Open Science Impact Pathways), a Horizon Europe project aiming to collect concrete evidence of Open Science effects, outcomes, and impact (PathOS, 2024).

Tzanova (2020), noting that “a single universal definition of Open Science does not exist”, suggests that its main components are open access, open source, open data, open methodology, open educational resources, and open standards. The influential UNESCO understanding of Open Science is

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. It comprises all scientific disciplines and aspects of scholarly practices, including basic and applied sciences, natural and social sciences and the humanities, and it builds on the following key pillars: open scientific knowledge, open science infrastructures, science communication, open engagement of societal actors and open dialogue with other knowledge systems. (UNESCO, 2021)

The key components of this model are shown in Figure 2.

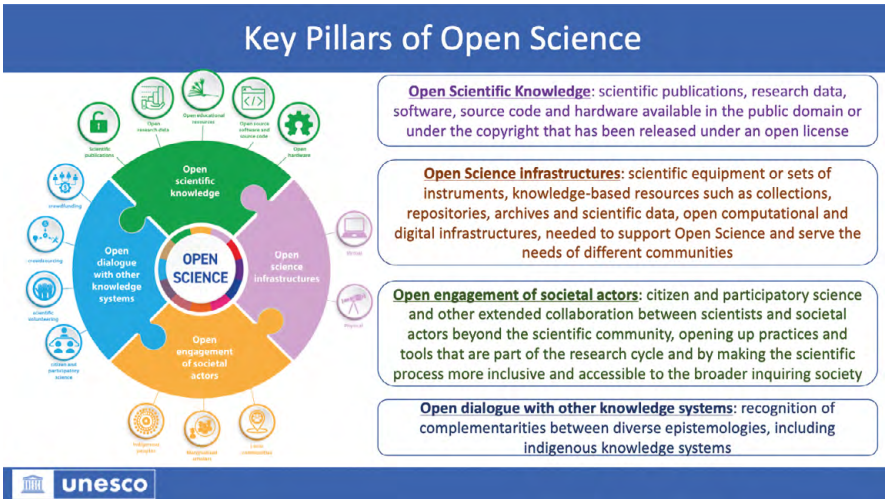


Figure 2: Key components of the UNESCO definition of Open Science

Open Science, although it has acknowledged practical problems to overcome, is often held to be inarguably a good thing. However, in some respects, Open Science may actually work against diversity, equity, and quality in the research process, which are supposed to be intrinsic aspects of the approach. A detailed analysis of this has been given by Sabina Leonelli, a philosopher of science with a particular interest in science communication, who gave a keynote presentation at the 2019 CoLIS conference in Ljubljana (Leonelli, 2022, 2023). Her analysis shows that science is rarely fully open; the location and status of researchers, and the availability of infrastructure, may limit participation. Pinfield (2024) makes similar points about the need for scientific openness to obtain the benefits of open access. There remains some prejudice against open access publication of scientific research, often conflated with predatory journals or pay-for-publication arrangements, and against open source software, with proprietary software assumed to be of better quality. To an extent, the privileges of the global north are perpetuated in an open science environment, and more open and collaborative networks need to be developed to combat this (Arthur et al., 2023). It is notable that the countries of Latin America have developed and maintained a unique system of open access, with scientific publication largely being handled by academic institutions and financed through public funds. A number of non-commercial platforms have emerged, enabling discoverability of Latin American research output through open access journals and green open access repositories (Torres and Hartley, 2019). Furthermore, the removal of so-called frictions in the communication of scientific information, although generally assumed to be beneficial for everyone, may allow low-quality, or even false, data to circulate and may similarly allow unethical or socially harmful research to be reported if gatekeeping barriers to publication and paywalls on published material are removed. There may also be security concerns about sharing scientific research without limitations. A recent European Commission proposal on research security recommends that science be “as open as possible, as closed as necessary” and that the FAIR principles be applied “with due consideration to applicable restrictions, including security concerns” (European Commission, 2024). Librarians, with their understanding of the communication of information and their ethical commitments, should be well placed to help mitigate all these problems.

Indeed, Open Science, with its emphasis on frictionless communication of knowledge, seems to be a natural fit for the library sector, and indeed many initiatives have been undertaken; for reviews, see Kaarsted et al. (2023), Liu and Liu (2023), and Giustini et al. (2021). Peršić and Straza (2023) set out a role for libraries in the specific context of the implementation of the UNESCO Recommendation on Open Science. Other initiatives, developed independently of the library sector, may be appropriate for adoption and recommendation by libraries. For example, Ask for Evidence, a campaign run since 2011 by Sense about Science, a United Kingdom

charity which promotes public interest in reliable scientific information, encourages and supports the general public in asking for evidence about news stories and policy recommendations regarding health issues (Sense about Science, 2024). Such campaigns could helpfully be supported by public libraries, while Sense about Science has partnered with the libraries of the UK Parliament to promote scrutiny of scientific information to elected members of parliament.

The very broad scope of what a commitment to Open in general may mean in practice for libraries is illustrated by the Open Library Badge (OPB) initiative, originating in Germany and to an extent influenced by the German context (Putnings, 2023). OPB is an incentive system for libraries to embrace ideas of openness, with a badge awarded to libraries which meet at least five of fifteen criteria:

- contributing to open source software
- making the library's own material accessible to all
- emphasising Open as an aspect of recruitment and staff development
- offering professional development and training on openness issues to library staff
- enabling text and data mining on the library collection
- providing open information on costs of acquisitions
- making open access resources visible in library search systems and catalogues
- providing advisory services on open science and open access
- providing all the library training materials open access
- involving users in library functions and activities
- openly documenting all library processes
- supporting open knowledge communities such as Wikimedia
- mandating open access for all publications of library staff
- making all photographs of the library openly available
- making the library an open place for all, including disadvantaged and vulnerable groups.

3 Open infrastructure for libraries

Open science requires an infrastructure, both technical and organisational, to support its aims, and this is an aspect in which libraries of all kinds are already heavily involved. The best-known example of this is the open access repository of published scientific and scholarly materials; increasingly, repositories will also include data compilations, open educational resources, and other non-published items. Such repositories are often maintained by libraries, particularly by university libraries providing free access to their research reports and data. Tzanova (2020) gives a number of international examples, particularly from the libraries

of the City University of New York, and further international examples are to be found on the Re3data website (Re3data, 2023). Commenting on the influence of open data, and open big data, as a part of Open Science on academic libraries, Tzanova asserts that this does not just lead to providing new services based on data but also demands changes to the administrative structure of libraries, with new roles for librarians requiring new skills and qualifications with respect to data management and data literacy, and more active collaboration by libraries in research projects. An indication of the infrastructural changes – integrated with national and institutional strategies – needed for libraries to participate in and support open science initiatives is shown in a poster presentation from the University of Paris Nanterre (Cassafieres, 2023). Wallis (2023) discusses the infrastructure needed for library support of citizen science, covering a variety of issues, including repositories and data management, crowdsourcing and use of social media, and metadata descriptions and persistent identifiers.

Libraries are starting to go beyond providing open access for formally published materials to embedding openness in library operations. Ball, Stone and Thompson (2021) show, in the context of monographs in university libraries, how systems for acquisitions, promotion of material, and evaluation of services may be changed to allow open access materials to be provided with the range and visibility accorded to “paid for” materials. They argue that “cultural change and leadership is required within libraries to reimagine themselves around open content as the norm, with policies, practices and structures that communicate, enable and promote this shift”. Similarly, Mićunovic, Rako, and Feldvari (2023) describe the role of libraries with respect to open educational resources, arguing that libraries are not limited to simple provision of existing OERs but may also initiate creation of OERs, and may partner with OER advocates to promote these resources. Tzanova (2023) gives the example of libraries at the City University of New York converting teaching resources used in high enrolment courses to EORs, with the aim of creating “Zero Textbook Cost” courses; this is a long-term aim, and clearly creation and provision of resources free of charge to their users is not without cost to the institution. Such partnerships may support other forms of open science: for example, the library at the Massachusetts Institute of Technology has partnered with their science faculty in awarding an annual MIT Prize for open data to “researchers who use or share open data, create infrastructure for open data sharing, or theorize about open data” (Fay, 2023).

Open infrastructure goes beyond even this, however. In addition to provision of open access publications and educational resources as well as repositories for information and data, with associated issues of curation and of metadata curation to ensure accessibility as well as openness in principle, such infrastructure is usually taken to include tools for sharing ongoing research results, remote

working, remote collaboration, and outreach. These all need to be embedded in a culture supporting openness in all its aspects. Ignat and Ayris (2020) give a series of practical case studies of the culture change needed for open science, based on a series of events throughout Europe to promote such a change, the first of which was held in Ljubljana in 2015. Elements of the case studies include academic libraries, repositories, publishers, and citizen science.

Tzanova (2020) points out that academic libraries may play a leading role in fostering a culture of openness across the research communities which they support through extensions of the traditional library role as advisor and instructor. Libraries may draw from, and contribute to, wider infrastructures enhancing a culture of openness, such as European Open Science Cloud (EOSC, 2023), a collaborative infrastructure for hosting research data tools, services, and datasets and making them available for reuse (Stojanovski and Grabarić Andronovski, 2023). Adoption of open source software for a library's own operations will also signal a commitment to openness, as with the decision of the National Library of Sweden to move to open source discovery and workflow management systems starting in 2025 (National Library of Sweden, 2024).

4 Citizen Science and libraries

Citizen Science, sometimes termed *civic science*, *community science*, or *crowd-sourced science*, is scientific research conducted with participation from the general public, without scientific qualifications or affiliation; there are a variety of precise definitions ("Citizen science", 2023). Increasingly recognised as a valid research approach, it now has its own journal, *Citizen Science: Theory and Practice*, published open access by Ubiquity Press, while a *Librarian's Guide to Citizen Science*, aimed primarily at American public librarians and giving a variety of examples, denotes it as "a growing trend that libraries won't want to miss" (Cavalier et al., 2019).

Public involvement in research is not a new idea (Highfield, 2015), the first proponent apparently being British astronomer Edmund Halley, whose appeal in a scientific journal for observations of a solar eclipse in 1715 brought assistance from a large number of people. Charles Darwin obtained information on living species from thousands of correspondents while devising his theory of evolution, and the American Audubon Society enlisted amateur observers in its annual bird count from 1900. It is worth noting that old citizen science records and collections held in libraries and archives may be enhanced in value in a digital open science environment. An example is the digitisation of paper maps recording

land usage throughout the British Isles made by thousands of volunteers in the 1930s, enabling comparison with modern satellite mapping to show changes in land use (Suggitt and Auffret, 2023).

Citizen science, much enhanced by digital information collection, storage, and communication, is now applied in a wide variety of scientific areas, with a particular focus on the biological sciences and on natural history. Typical examples include transcription of old weather records; biodiversity surveys in a locality; the monitoring of air quality in a locality; recording dates of flowering of plants, migration of birds, and similar phenomena, both by direct observation in a locality by analysis of historical records; and analysis of collections of astronomical images. See, for example, the BBC (n. d.).

There is a role for libraries of various kinds as focuses for, and facilitators of, citizen science projects; this is one aspect of Open Science in which public libraries can play a particularly significant role because of their reach into local communities and their accessibility for all citizens. LIBER, the association of European research libraries, has been prominent in its support for library-based citizen science. Its Open Science Roadmap (LIBER, 2018) includes the assessment that “national and research libraries assist if not lead in lifting the potential of Citizen Science. The possibilities for libraries to do this are seemingly endless”; it recommends that libraries be active partners that play an organising and managing role in citizen science projects, with clear policies and skills developed in science communication, technology applications, and project management. Based on this roadmap, LIBER is developing a four-part book series *Citizen Science for Research Libraries Guide*, a practical toolkit for running a citizen science project based in a library. The first book deals with citizen science skilling for library staff, researchers, and the public (Hansen, 2021), providing step-by-step guidance and examples of projects on topics such as project planning, communication, data management, and scientific literacy. The second, as noted above, deals with library infrastructure and citizen science (Wallis, 2023). Forthcoming, as of April 2024, are sections on open science practices in citizen science and on guidelines for citizen science activities involving libraries.

The US National Library of Medicine has supported the creation of a training module on “Libraries as Community Hubs for Citizen Science” to promote best strategies, practices, and resources for libraries to take a leading role in citizen science projects (Scistarter, 2021).

Libraries may take a significant role as coordinators of citizen science, both inside their own institutions and externally. An early example from the United States saw Arizona State University’s Hayden Library joining with Arizona State

Library and six public library services to develop citizen science programmes (Peet, 2017). Also in the United States, the National Library of Medicine's network regards community science as a priority, providing training and funding, their best-known effort being a yearly Edit-a-thon to improve Wikipedia as a health information resource (NNLM, 2023). Martek, Mučnjak, and Mumelaš (2022) report a European Union sponsored project on support for citizen science through cooperation between university libraries and public libraries in Southeastern Europe, finding that such cooperation can be very fruitful but is likely to be faced by limitations of time, resources, and knowledge of the topic. Stemming from the same project, Kaarsted et al. (2023) find that European research libraries have a good understanding of both open science and of citizen science and a desire to engage but that significant barriers of resources, funding, and policy exist. In the United Kingdom, the library at University College London acts as a central point for coordinating citizen science activities in the university, with a variety of projects reports in natural science, medicine, and engineering, as well as the social sciences and humanities (UCL, 2023).

Mumelaš and Martek (2024), from the National and University Library in Zagreb, give a thorough review of the benefits of an involvement by libraries of all kinds in citizen science projects. These benefits include the recognition of libraries as partners in scientific research, media recognition and attraction of new library users, enrichment of library collections and services, and personal and professional development of library staff. Furthermore, "libraries ... position themselves as promoters of inclusivity in knowledge creation, thereby reinforcing their role as relevant and progressive institutions in society."

To give a further sense of the types of citizen science work which may be supported by libraries of different minds, we can also mention the following examples:

- The libraries of the City University of New York are leading on the management of data sets for an urban microbiome project, AREM (Authentic Research Experience in Microbiology), in which students from a number of colleges collect and analyse samples of microbial life from the streets and parks of their local area (CUNY, 2023).
- The library of the University of Southern Denmark takes a coordinating role in the "Find a Lake" project, in which school pupils and the general public collected samples from local lakes and ponds for water quality analysis (SDU, 2020).
- Maricopa County Library District, a set of fifteen public library branches in Arizona, USA, offers citizen science kits to its users, enabling them to take part in data collection for projects such as the assessment of indoor and outdoor air quality, measurement of light pollution, documentation of biodiversity, and counting of beneficial and harmful insects (MCLD, 2023).

- In France the library of the University of Bordeaux put on a series of events and exhibitions to promote engagement in the SPIPOLL project, in which the public photograph insects foraging on flowering plants as a way to increase knowledge of pollinators SPIPOLL (n.d.).
- In Spain the Barcelona Network of Public Libraries developed a training course and toolkit for citizen science activities and coordinated a citizen social science project on local housing issues (Cigarini et al., 2021).

5 Science communication and libraries

One important aspect of Open Science is providing access for non-scientists to reliable and understandable scientific information. There is a role for libraries as a conduit for open science communication to the wider public, in particular by countering the dissemination of false information via social media, which has been seen with issues such as COVID-19 and climate change. The frequent exhortation to the general public to “do your own research” by seeking additional or alternative sources of information might at first sight seem something which libraries might wish to support and encourage. However, this phrase, first made popular by an American conspiracy theorist (Ballanyne and Dunning, 2022), all too often leads those without any scientific education to rely on “alternative facts” originating from anti-expert, biased, and extremist viewpoints. The problems with this are well summarised in a short article by Siegel (2020) and are thoroughly researched in a study on COVID-19 misinformation by Chinn and Hasell (2023).

Library-based open science communication can help to counter this. A conceptual analysis of the problems of the “do your research” idea suggests that two solutions are a reliance on *expert testimony* (testimony being used here in the philosophical sense and meaning simply the writings of experts) and on *shallow research* (Levy, 2022). “Shallow” sounds rather negative, but it simply means the kind of research that we all do on topics on which we are not experts – finding and consulting reliable sources aimed at non-experts. Both of these solutions are things which libraries should be well placed to promote. Of course, it is important that the sources for this form of research are openly available; to have expert testimony trapped behind a paywall, while fringe theories are openly available, would be very damaging. Google Scholar, for all its problems with inclusions with a wide variety of types of material, is very useful here (see, for example, Altaibi, Johnson, and Rowley, 2021).

Much of what libraries can do to assist patrons in their own research will build on “traditional” library guidance and on instruction in information and digital

literacies. There are specific points to bear in mind in helping good communication of trustworthy and relevant scientific information, without taking an unhelpfully paternalistic attitude as to how patrons should do their research. Practical advice on how this can be achieved is given by Denver Public Libraries (Ross, 2021), McGill University (Jarry, 2022), and a librarian at Bookriot (Pryde, 2021), while the LIBER guide includes a section on the improvement of scientific literacy through citizen science (Hansen, 2021).

6 Libraries as demonstrators

Perhaps the clearest and most influential way in which libraries may promote Open Science is by taking the role of *demonstrator*, showing how open technologies can be applied to their own collections. This may be done most simply by offering and publicising as many open resources of diverse kinds as is possible, but some libraries may be able to go beyond this by applying, and demonstrating the value of, new open technologies.

An example of this is the use of Jupyter Notebooks with library data. This technology has been developed as a popular interactive and collaborative computing environment for Open Science. A Jupyter Notebook is an interactive document that can display and share text, images, code, and data visualisations, working on a local computer or in a cloud environment, and can “help humans to think and tell stories with code and data” (Granger and Pérez, 2021). They are valuable for open science, as they enable documentation and explanation of data, code, and results and make reuse of data easy through data cleaning, analysis, exploration, and display.

For libraries, Jupyter Notebooks are useful for exploring digital collections as data, enabling research that complements close readings of text with distant readings, as well as dealing with collections of numeric and factual data. They can help openness, in that the contents of large library datasets can be relatively easily analysed and explored by anyone, including those without coding skills. Jupyter Notebooks also align with the FAIR data principles of findability, accessibility, interoperability, and reuse, and it is important that libraries support these principles as part of a commitment to Open Science (LIBER, 2020). Their use therefore promotes open research values such as reproducibility and also brings library collections to new audiences, facilitating “a shift towards an environment that integrates code and data as a complement to physical and digitised collection items” (Havens, 2020).

Candela, Chambers, and Sherratt (2023) give an overview of the adoption of Jupyter Notebooks by libraries and other cultural heritage institutions, including a significant number of national libraries (such as the Library of Congress, the British Library, the National Library of Scotland, the national libraries of Austria, Estonia, and Germany) and Europeana. Although many applications are, understandably, to literary and cultural data, examples including study of the climate indicate that this technology is of clear relevance to open science, particularly with elements of citizen science.

A good example of the library application of Jupyter Notebooks comes from the National Library of Scotland in Edinburgh; an overview of the project is given by Ames and Havens (2022), with detailed examples in Havens (2020). The project is based on the premise that, while this library's extensive datasets are valuable resources for those with computer programming skills, those without the ability to code are left unable to take full advantage of these collections. Detailed information about each collection is provided at the start of each Notebook, summarising the contents and significance of the collection together with the data format, which dictates how the dataset can be explored and the data creation process; this shows the links between the dataset and associated items in the library physical collections. Each Notebook is structured around the same sections: Preparation, Data Cleaning and Standardisation, Summary Statistics, and Exploratory Analysis. In all sections, explanatory text accompanies code, showing what the code does and how its results are presented and, where not self-evident, the results of the code. To represent the range of the library's collections, the datasets chosen for analysis in Jupyter Notebooks are diverse in size, topic, and format. Most relate to cultural heritage, but a dataset relevant to Open Science is a "Medical History of British India", digitised and manually corrected text of 468 papers from 1850 to 1950 covering topics related to public health, disease mapping, vaccination, and veterinary practice.

7 Conclusions

Open science in its various aspects presents a great opportunity for libraries of all kinds, as shown by the examples already available. To take full advantage of this opportunity, significant changes in library infrastructure and attitudes will be needed in order to overcome the obstacles of resources, funding, staff development, and local policies. In particular, it is essential that libraries of all types form partnerships with other libraries and other institutions; this is not an area where any library can, or should, go it alone.

The open movement, and open science within it, are seductive for libraries, since the philosophy of openness seem very much in line with the values of librarianship. There are some negative aspects to openness, and libraries may be well placed to help minimise and overcome these.

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