

Merry work: libraries and citizen science

This article highlights important new opportunities for libraries by analysing the roles they could potentially play in citizen science projects. Citizen science is one of the eight pillars of open science identified by the Open Science Policy Platform, an EC Working Group. The authors of the article suggest that roles for libraries wishing to support or engage in citizen science could include contributing to specific skills development; building and maintaining collections of protocols, data forms and educational materials; contributing to making data FAIR; supporting new communication roles; participating in recruitment and helping volunteers to participate in projects; participating in marketing activities; building further advocacy and developing or implementing a toolkit for citizen science projects. Several of these roles are illustrated by contributing authors in case studies from their institutions, where citizen science has already been embraced: University College London, the University of Barcelona, the University of Southern Denmark and Qatar National Library. This article thus presents a snapshot of what libraries have so far achieved in this sphere and the challenges and opportunities which remain.

Keywords

Citizen science; University College London; University of Barcelona; Qatar National Library; University of Southern Denmark; research libraries; open science



TIBERIUS IGNAT
Director
Scientific Knowledge
Services



PAUL AYRIS
Pro-Vice-Provost
(UCL Library Services)
University College
London



IGNASI LABASTIDA
I JUAN
Head, Office for the
Dissemination of
Knowledge
CRAI Universitat de
Barcelona



SUSAN REILLY
Director, Digital Content
& Engagement
Qatar National Library



BERTIL DORCH
Library Director
University of Southern
Denmark



THOMAS KAARSTED
Deputy Library
Director
University of Southern
Denmark



ANNE KATHRINE
OVERGAARD
Head of External
Projects, Faculty of
Health Science
University of Southern
Denmark

Citizen science and possible roles for libraries

There are many definitions of citizen science. When we use the term in this article, we are referring to the collaboration between professional scientists and the rest of society. Please note that we see such collaboration as a two-way activity, which will empower citizens to play a role in research activity and, as a result, produce improvements and make discoveries which will be of benefit to society as a whole.

Citizen science effectively relocates scientific activities into a wider community and offers grounds for more interaction between science and society. Research communities and public libraries are already well placed to support citizen science. The effectiveness of this support, however, depends on the extent to which such communities feel empowered to successfully engage in citizen science activities. A better understanding of the benefits, and the resources and skills needed, would encourage libraries to engage with citizen science more fully.

Management skills may need to be developed in areas such as:

- working with remote teams
- collaborative task management
- managing dynamic division of labour
- communication with large audiences
- citizen science project management
- time management for participatory projects
- recruiting and managing volunteers (along with the avoidance of 'volunteer burnout').

Library managers may also need to make changes in some other areas in order to promote citizen science activities to new communities of users. This might mean:

- reallocating resources
- training marketing staff to understand this new audience.

To take all these agendas forward, there is likely to be a need for investment if libraries want to add citizen science support to their portfolios.

Citizen science represents one of the eight pillars of the European Commission's definition of open science.¹ Research universities have already begun to engage in the important topic of open science, and a detailed response to the Commission's open science agenda was launched by LERU (League of European Research Universities) in June 2018, led by Dr Paul Ayris.² LERU itself has issued advice papers on a number of areas in the open science agenda.³

The Commission's position on open science is not the only driver for research universities to embrace open science practices. The prevalence of digital delivery and the omnipresence of the internet still promise potential for developing new services and solutions. As Sir Tim Berners-Lee says, 'The Web as I envisaged it, we have not seen it yet. The future is still so much bigger than the past.'⁴ Another factor is the perceived disconnect between universities and society, which has led many universities individually to investigate new ways of engaging with the general public. The prevalence of 'fake news'⁵ and society's distrust of expert opinion underlines the need for universities to make themselves even more open and relevant to society.

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On 23 April 2018 the Open Science Policy Platform,⁶ a group that advises the European Commission on how to develop open science policy, adopted a set of recommendations on citizen science.⁷ This paper states that research libraries are well placed to actively contribute to citizen science. We believe that this statement is also valid for other libraries, such as national, public and school libraries.

3 LIBER (The European Association of Research Libraries) has also produced an Open Science Roadmap, which it launched at its 2018 Annual Conference in Lille.⁸ LIBER, the largest association of European research libraries, feels that a revolution is needed for open science to become embedded in European universities. 'Research libraries are well placed to make that revolution happen.'⁹ It makes four recommendations to further the citizen science agenda, with the aim to 'promote the library as an active partner in citizen science and develop the necessary infrastructure to effectively support public researchers in their work'.¹⁰

The type of collaboration that is built through citizen science represents a solid lever for developing science, where the broader society is the fulcrum. The other two levers are represented by public research and private research. In this way, we can obtain trigonometric ratios for science to triangulate better means for pursuing new discoveries.

Two of this article's authors have now presented in a total of 12 European locations,¹¹ initially speaking at the LIBER Conference in 2012, on roles that libraries can play in citizen science. Suggested roles include:

- develop skills for engaging in citizen science projects
- support, build (or be part of) a toolkit for developing citizen science projects in your institution or offer your respective services to other organizations
- build collections of protocols, data forms and educational materials
- contribute to making data FAIR (findable, accessible, interoperable and reusable) and develop collections of data sets
- offer infrastructure
- contribute to evaluation processes
- communicate all new findings and support both scholarly and popular science communications
- participate in recruitment and retention processes and assist volunteers to participate in projects
- participate in marketing activities
- promote a positive attitude towards citizen science.

Several of these roles are illustrated in the following case studies.

Early experiences and case studies

UCL Library Services and citizen science

UCL Library Services is part of a large research-led university, University College London (UCL), in central London.¹² UCL is the third oldest university in England, founded in 1826. It was the first university in England to welcome students of any religion, and the first to welcome women on equal terms with men.¹³ Building on its history, the University is embracing the principles of citizen science as it develops its offering in this area. The Library's current strategy document¹⁴ will be revised in the autumn of 2018 to include activity in citizen science as part of its open science activity.

UCL is developing a major campus in east London, on the former London Olympic site, which is called UCL East.¹⁵ The Library will have a learning hub here and this will be the base for its citizen science activity in the London district of Stratford. UCL is one of the specialist collectors of publications on the history of London and the Library will use its new base in UCL East to create a London Memory Archive, which will be the home for this material. The Archive will also seek project funding to develop a social history of the area, recording oral history from the local inhabitants and digitizing their photographs, diaries and other memorabilia to create an interactive social history of this vibrant area.

'the Library will use its new base in UCL East to create a London Memory Archive'

4 UCL Library Services is one of the principal homes of the archive of the 19th century utilitarian philosopher Jeremy Bentham, comprising 60,000 manuscripts and 4,500 volumes.¹⁶ The manuscripts consist of drafts and notes for published and unpublished works, drafts of letters from Bentham (1748–1832) and a few letters to him. Bentham is perhaps best remembered for the doctrine of utilitarianism. Happiness for Bentham meant pleasure with a lack of pain.¹⁷ The Bentham project is run from the UCL Faculty of Laws with support from UCL Library Services and others engaged in digital humanities.¹⁸ The main output of the project is a new edition of Bentham's *Collected Works*.¹⁹ The project initiated the double award-winning 'Transcribe Bentham' crowdsourcing initiative.²⁰ Members of the public with an interest in Bentham are able to transcribe material from his archive and to submit that for further polishing and inclusion in the published *Collected Works*. As of 20 July 2018, a total of 20,523 manuscript pages have now been transcribed or partially transcribed. Of these transcripts, 19,577 (95%) have been checked and approved by Transcribe Bentham staff. Progress on each box of Bentham material can be checked on the Benthamometer.²¹

'Innovation is key to stimulating interest'

Levels of engagement are high and the project has a number of approaches to encourage volunteers. In February 2018 Dr Tim Causer (Senior Research Associate) reported that 624 individuals had attempted transcriptions, although the bulk of the material came from 25 'super transcribers'. Innovation is key to stimulating interest, and in October 2017 the project held a Bentham Hackathon, where six teams worked to see how digital tools could help in the publication of Bentham's works.²²

The project has published an important analysis of the crowdsourcing activity involved in Transcribe Bentham.²³ The project considered two main questions:

1. What is the academic quality of crowdsourced transcriptions?
2. Is crowdsourced transcription cost-effective?

The conclusions which the project drew are listed below.

- Crowdsourcing transcription is not a panacea.
- For crowdsourcing to be successful, the systems used need an excellent interface mirrored by interesting content to be transcribed on a stable platform.
- A project manager is needed to manage the volunteer effort.
- The whole project needed careful project management.
- Volunteers produced transcripts which are of 'extraordinarily high standard'.
- Taking all costs into account, Transcribe Bentham will be cost-effective despite significant initial investment.

Transcribe Bentham has been an important project for UCL Library Services. It is the first citizen science project with which the Library has become engaged. Based on the success of this project, the Library can now broaden its approach in UCL East to deliver cutting-edge citizen-led historical research on the history of this important part of London.

The University of Barcelona and societal engagement

The University of Barcelona (UB) is currently working on an open science policy aimed at fostering and acknowledging related research practices. 'Participation and engagement addressed to society' is one of a number of themes covered in the policy. The focus of this theme will be the dissemination of research developed at the institution and the promotion of its ongoing citizen science projects. This theme will also link to a separate theme dedicated to reviewing the evaluation of staff in recognition of the fact that many dissemination and participation activities are not yet acknowledged or rewarded.

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In recent years UB has been engaged in several citizen science projects through different research groups. The most active of those groups is OpenSystems,²⁴ led by the physicist Dr Josep Perelló. This multidisciplinary group has developed many projects focused on public

5 participation in all research processes. Moreover, OpenSystems was one of the founders of the European Citizen Science Association and the creator of the Barcelona Office for Citizen Science, which Dr Perelló currently co-ordinates.

A key concern of these research groups is the lack of formal recognition by the institution of activities that do not fit into the current (rigid) staff assessment processes. Although they publish some papers in renowned journals, not all the outputs and outcomes of their research achieve such recognition and this needs to change.

The University, through the Library, has begun to provide these research groups with a certain level of support. Through the Office for the Dissemination of Knowledge,²⁵ the groups have received advice and support on managing legal issues, especially copyright and data protection. Most of the groups are committed to the open dissemination of all their activities, so they were therefore looking for solutions on how to use, for instance, suitable licences or legal tools aimed at openness. The Library has also provided advice and support on creating data management plans aimed at returning to citizens data originally gathered by them once they have been processed. This collaboration has even been included in the EU-funded project STEM FOR YOUTH.²⁶ Moreover, researchers can deposit and publish their data via the institutional repository.

One of the expectations for the coming years is that the University and other organizations will broaden the scope of research outcomes that are to be included in internal and external evaluations. These changes are being introduced step by step, with the inclusion of data and software as the first new items to be considered. There is an urgent need to begin to acknowledge the societal impact of research, and these innovative ways of practising science by engaging members of the public could be a good example. Besides these changes and recognition of these new practices, the increase in the number of citizen science projects and the public dissemination of research activities could allow universities to become more open and inclusive.

Building the foundations of citizen science at a national library: Qatar

The mission of Qatar National Library (QNL) is to spread knowledge, nurture imagination, cultivate creativity and preserve the nation's heritage for the future. Engaging in and supporting citizen science activities is a means of achieving all of these things. Not only does citizen science offer QNL a vehicle through which to realize its mission, but QNL is extremely well positioned to support citizen science, so the relationship is symbiotic. Located at the heart of Education City, a campus hosting several prestigious universities, research centres and schools, QNL offers a third space between the formal education system and research institutions as the home where people can come to explore, indulge their curiosity and drive their own learning. The proximity to research institutions affords easy opportunities for citizens to interact with local researchers, e.g. by attending lectures at the Library.

As well as facilitating access to expertise, the Library provides access to tools and technology such as design and statistical software, recording equipment and 3-D printers. QNL is also actively supporting one of the key preconditions to spreading citizen science – open access to research outputs – through its repository for research data and articles as well as via an open access fund. This means that citizens will not only have access to national research outputs, but also have the opportunity to contribute to the national body of research works.

Next steps

Once resources, tools and infrastructure are in place, QNL will seek to actively engage citizens and establish the Library as a focal point for citizen science. One of the first steps towards this is the fostering of scientific discourse, e.g. through the QNL Science Book Forum for children.²⁷ The Forum is a venue for children to read about and discuss science with their peers and visiting scientists. In bringing science outside the formal venue of the classroom, the Forum encourages participants to look at science in a new way: not only as

6 something to be learned but also as a lens through which to view the world. Summaries of the books used in the Forum are provided in both Arabic and English. The aim of this Forum is to equip young citizens with the knowledge they need to engage in citizen science, thereby establishing the Library as a locus for such activities.

Many national libraries have made their first forays into citizen science through crowdsourcing projects. The British Library (BL) has a long track record in leveraging crowdsourcing to improve the accessibility of its collections. Libcrowds,²⁸ the BL crowdsourcing platform, has hosted 50 projects to date, e.g. to transcribe card catalogue records or plays. Contributors are recognized for their contributions and all of the donated data are made available openly. The Qatar Digital Library is currently trialling crowdsourcing for optical character recognition (OCR).²⁹ Crowdsourcing transcription of Arabic manuscripts in order to create ground truth for OCR is a first step towards increasing the accessibility of Arabic heritage material and furthering research in this area. While strides have been made in the OCR of modern printed Arabic, the challenge of using machines to read Arabic manuscripts has yet to be addressed. QNL is readying itself to do further work in this area.

There are also opportunities to use crowdsourcing in a more targeted way. In Finland, the national library used something they call 'niche sourcing' to gather more qualitative data from select communities to enrich and make meaningful its unique collection of Uralic language material.³⁰ In Qatar, this is an important approach to developing our heritage collections as one of the richest sources of heritage material is the citizens themselves. UCL Qatar has already realized this, gathered oral histories and engaged citizens to identify settlements and now-abandoned villages.³¹ QNL has been working with the researchers to preserve this material and continue the oral history work that has already been started by UCL. Not only does this type of activity serve to preserve local culture, but it also helps to increase engagement in and promotion of the national language of Arabic.

'In Qatar ... one of the richest sources of heritage material is the citizens themselves'

Whilst QNL is unique in the sense that it is a completely new national library and is positioned on a campus dedicated to education and research, it is not unique in terms of its functions or mission. If we look at the traditional functions of a national library³² – collection development, collection management, preservation and conservation, making collections available, outreach, co-operation and collaboration – we can see that several of these activities can be linked to citizen science. Citizen science offers a way to enrich our collections and make them more accessible, introduces new research outputs to be preserved, is a means of engagement with our communities and offers opportunities for collaboration with other libraries and research initiatives, nationally and internationally.

The citizen science network at the University of Southern Denmark

Instigated in 2017, the citizen science network at the University of Southern Denmark (SDU) is still in its infancy. Yet, it has already produced an initial clutch of citizen science projects and begun building a citizen science model with a strong focus on partnerships, including media collaboration.

SDU is currently investigating whether citizen science should become a strategic area of development. For that purpose, the Library and Faculty of Health Science were first movers in the formation of a network across all five faculties, with a remit running until spring 2019 to:

- build citizen science projects
- engage in partnerships (including mass media)
- make recommendations on how SDU could proceed and whether an SDU model of citizen science is possible and feasible.

Early observations and organizational readiness

From an organizational standpoint, however, SDU is not altogether prepared to embrace citizen science. Although the network has the backing of the University's upper-level management, it is still in its infancy. However, citizen science receives strong interest from researchers and a number of key heads of departments. The network has already organized two co-creation workshops, with good results and tangible impact.

The projects

So far, the network has initiated the following projects:

- ***A Healthier Funen***:³³ a citizen science project with a major university hospital, which enabled citizens to vote on research investment. TV2/Funen is media partner and won the CirCom 'News stories for all' Award in 2018
- an ***Active Living Area*** on the farm and forest land (the size of 70 football pitches) around our central campus run in collaboration with the School of Sports. The area will open with a festival in 2019. A number of city partners as well as a major regional newspaper are on board
- ***community-driven journalism***: engagement with the School of Journalism and three media partners in order to create novel news formats for primary school students/pupils, local citizens and investigative journalists
- ***'narrative medicine'*** organized together with the Centre of Literature. Literature and writing classes are mandatory at the School of Medicine, thus prompting doctors to reflect on the nature and treatment of their patients. This project investigates whether this approach can be applied to the general public, thereby promoting or perhaps improving their general health conditions and promoting the collection of valuable data on public health issues. TV2/Funen is also a partner.

Other projects are in the pipeline. A key learning point seems to be that there is a direct connection between citizen science and the missions of mass-media partners that have a public service commitment. (In Denmark most mass-media outlets receive considerable public financial support.)

'to engage local citizens and to include them as equal members and co-creators of research'

What might the future hold?

The vision of the network is to support increasing participation by society in scientific activities, to engage local citizens and to include them as equal members and co-creators of research. Thus, the mission is to create an SDU model, including a number of strategic partnerships (e.g. mass-media outlets), with the end goal of a central citizen science office emerging from this model. A secondary goal is for the Library and Faculty of Health Science to become key players and help create a hub for citizen science, thus supporting open science.

Conclusions

Open science is a growing phenomenon in Europe and beyond. It is an area where the European Commission is taking an active role in advocating its benefits. Strategically, research-led universities are beginning to embrace the challenges it presents, including citizen science. The LERU advice paper on citizen science by Professor Daniel Wyler of the University of Zurich underlines the importance of this agenda.³⁴ This paper on the role of libraries in citizen science highlights a number of successful projects, suggesting that citizen science projects are of high academic quality and that the activities are cost-effective. Libraries thus have a potentially important role to play and an opportunity to advocate for citizen science. The Bentham project, for example, made a number of recommendations about how to identify success in such activity. Stable platforms, project management, clear guidance and support – these are all features of library activity. It is therefore a natural development of the role of libraries in supporting their users that they

'It is ... a natural development of the role of libraries in supporting their users that they should embrace citizen science'

8 should embrace citizen science as an activity. As LIBER has recognized, doing so would put the library in a leading position as it redefines itself and its role in the 21st century.

As well as the roles originally identified at the beginning of this article, these case studies have surfaced further roles and activities that libraries can engage in:

- ensuring that citizens have access to their own contributions and the product of the research that they participate in
- promoting and fostering the necessary literacy skills for citizens to critically engage in citizen science activities
- building partnerships with entities beyond the research sector to increase impact and enable sharing of resources
- facilitating local engagement and dissemination, e.g. through translation into local languages.

The Open Science Policy Platform recommends that the European Commission support the development of an online toolkit for citizen science in Europe³⁵ by:

- promoting citizen science as a European asset
- offering an entry point and interconnecting already existing activities and infrastructures at the European, national and local level
- highlighting particular achievements and best practices
- providing a regular overview of the changes in activities
- implementing open data standards for citizen science projects
- providing a set of guidelines and tools for citizen science for all stakeholders.

A toolkit for citizen science would be a useful instrument to support the creation of the aforementioned engagement. However, libraries should not delay their engagement with the citizen science agenda until the toolkit is created. In order to create it, our community needs to produce examples, to engage with other communities that are active in citizen science projects (e.g. museums and non-governmental organizations) and to share experience and practices. In this way, libraries can adopt a proactive role in taking this agenda forward.

Research libraries and public libraries across Europe and the world should seize the opportunity to develop joint services in the area of citizen science at local and international levels. Regarding the proposed toolkit that the European Commission might provide, libraries should play a proactive and leading role in its composition, either by contributing to this toolkit or, more importantly, by building services that support better implementation of citizen science activities. Any such toolkit should aim to support both local activity and global collaboration. By showing how the results of such science-society collaborations are meeting the standards introduced by open science, libraries will secure a pivotal role in our modern society.

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Abbreviations and Acronyms

A list of the abbreviations and acronyms used in this and other *Insights* articles can be accessed here – click on the URL below and then select the 'Abbreviations and Acronyms' link at the top of the page it directs you to: <http://www.uksg.org/publications#aa>

Competing interests

The authors have declared no competing interests.

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Corresponding author:

Tiberius Ignat
Director
Scientific Knowledge Services
Chamerstrasse 172, 6300 Zug, CH
E-mail: tiberius@scientificknowledgeservices.com

ORCID ID: <http://orcid.org/0000-0002-4839-2344>

Co-authors with ORCID IDs:

Paul Ayris
ORCID ID: <http://orcid.org/0000-0002-6273-411X>

Ignasi Labastida I Juan
ORCID ID: <http://orcid.org/0000-0001-7030-7030>

Susan Reilly
ORCID ID: <http://orcid.org/0000-0002-7426-8275>

Bertil Dorch
ORCID ID: <http://orcid.org/0000-0003-2594-6778>

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