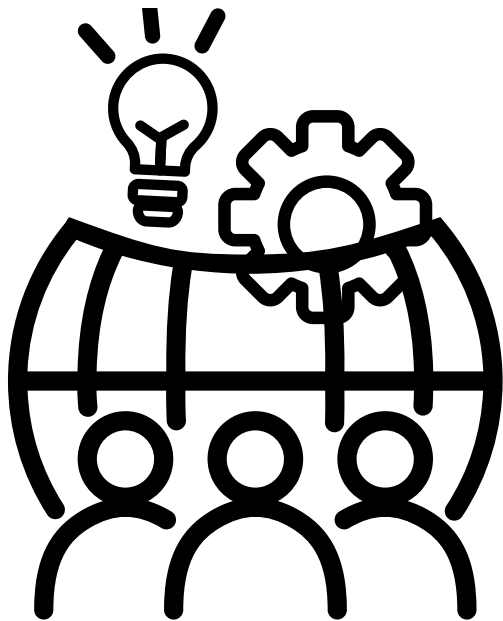


citizen **Heritage**

CITIZEN ENHANCED OPEN SCIENCE IN CULTURAL HERITAGE

Review and analysis of practices in higher education

By Katerina Zourou & Mariana Ziku



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ABBREVIATIONS

The following table presents the acronyms used in the study.

CARE	CARE principles (Collective Benefit, Authority to Control, Responsibility, and Ethics)
CeOS	Citizen-enhanced Open Science
CS	Citizen Science
FAIR	FAIR principles (Findable, Accessible, Interoperable, and Reusable)
GLAM	Galleries, Libraries, Archives, Museums
HEI	Higher Education Institution
OS	Open Science
SSH	Social Sciences and Humanities

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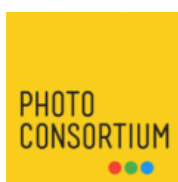
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STATEMENT OF ORIGINALITY

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Executive summary

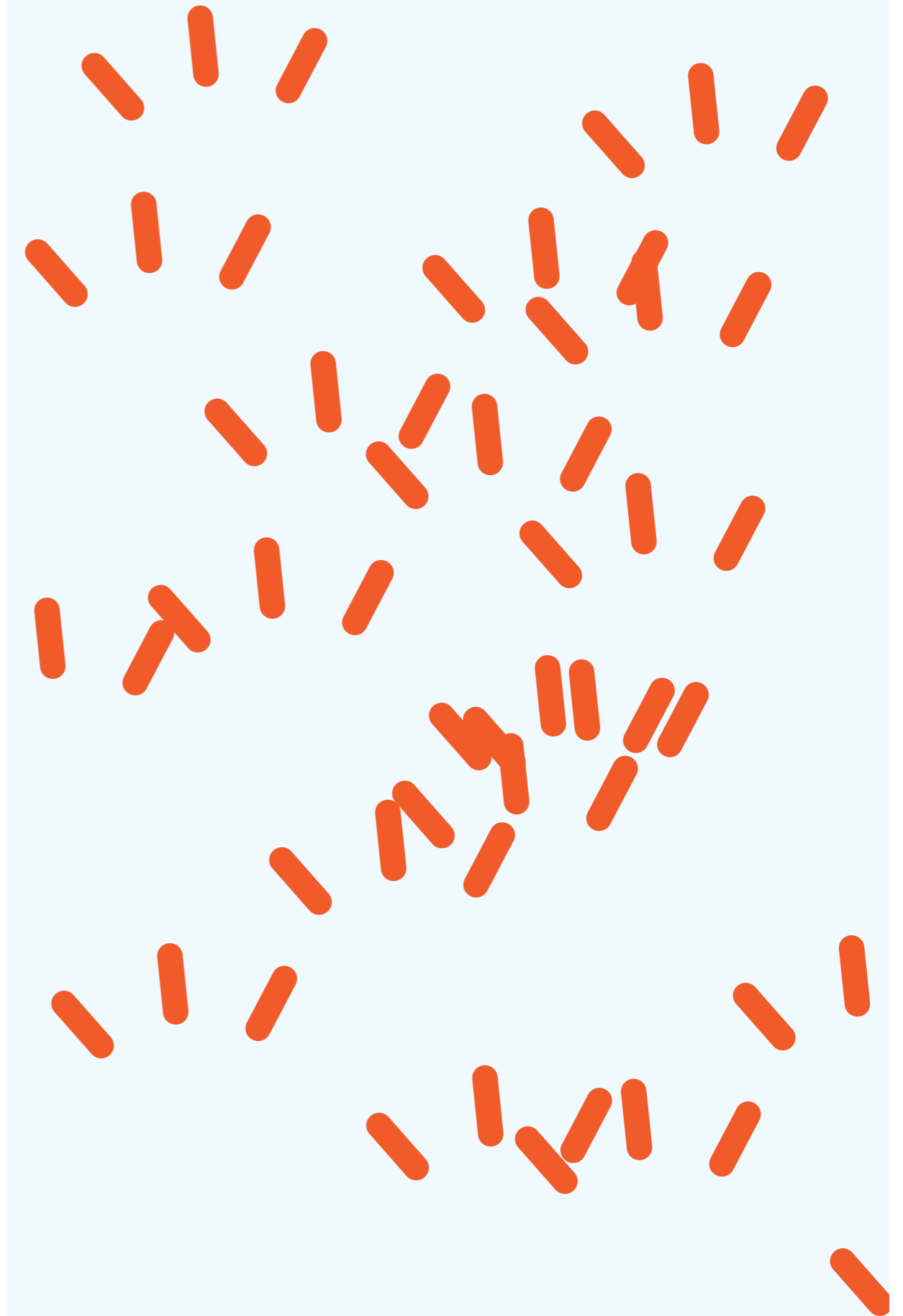
This publication addresses a largely underexplored topic: open and citizen science dimensions in the field of cultural heritage, by emphasising the role higher education institutions can play.

Some of the questions this study tackles are:

- How can universities act as citizen science incubators?
- How to connect civic engagement with open science?
- How to move towards active public engagement models in scholarly research, all with an application in the cultural heritage field?

The concept of “citizen enhanced open science” will serve to broaden the scope of open science by including public participation in the shaping of scientific research.

For the analysis, we identified - with the support of the project partners - 110 international cases, refined to 25 European-based practices. The study maps the infrastructures, digital tools and typologies which enable the active involvement of citizens in scientific knowledge co-creation. The applied typology is informed by several European policy guidelines and initiatives that discuss the connection between open science, higher education and civic engagement. We opted for a data-driven approach which elaborated on the concept of “citizen enhanced open science” analysing, among others, such dimensions as open data, FAIR data, type of participation and form of civic engagement; presenting the results through data visualisations.



Chapter 1: Citizen enhanced open science

1.1 At the origins: open science¹

Citizen science, participatory research, public engagement with science and technology, community-based research, do-it-yourself (DIY) research: several concepts can apply to the engagement of the public in the production of scientific knowledge. Although each of the aforementioned terms differs at some points from the others, they all reflect an increasing interest in doing science in a more open fashion. Their common denominator is open science and its various forms are outlined below.

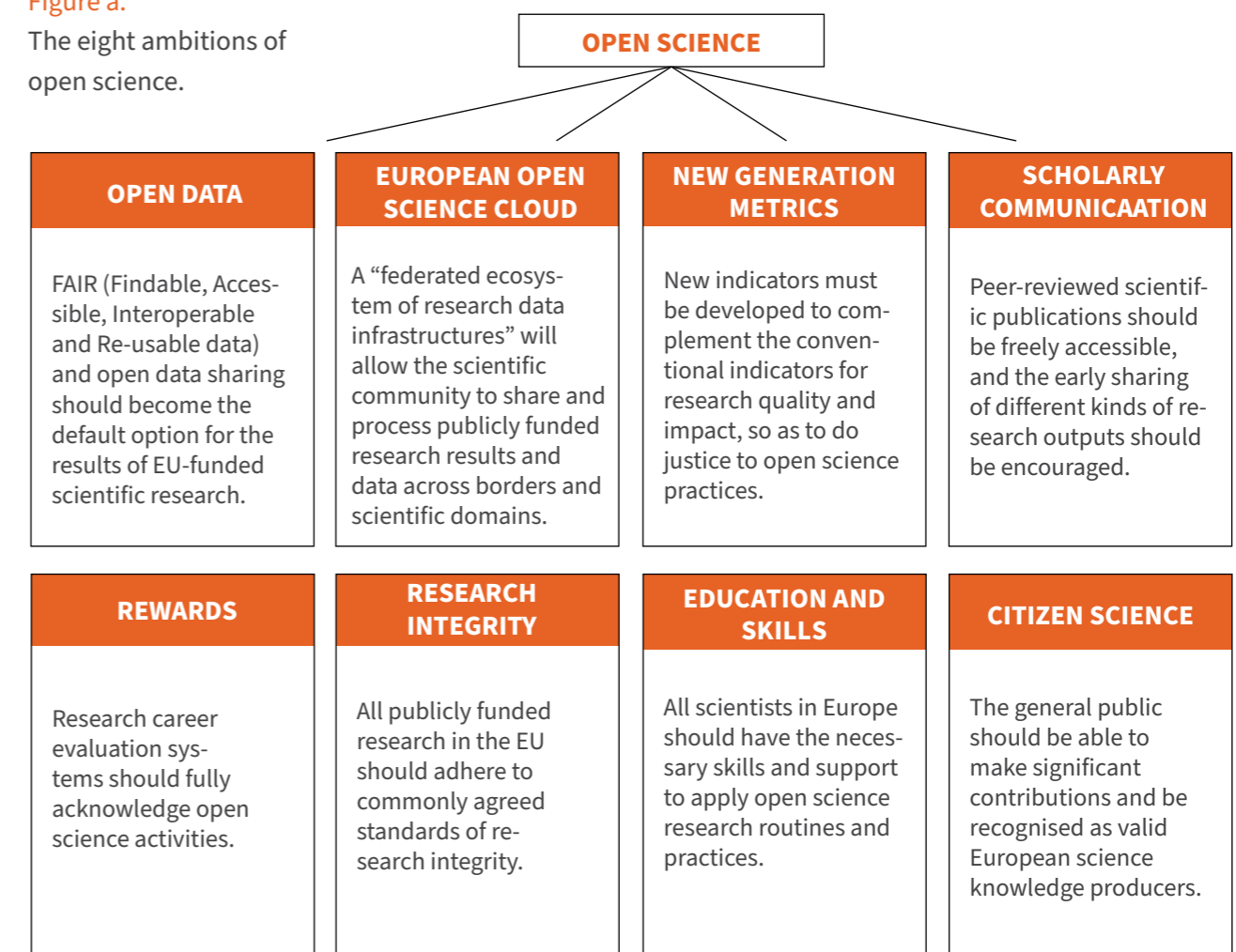
Open science is a global phenomenon affecting many dimensions of everyday life. Open access to publications and open data are, however, considered to be its cornerstones. More generally, open science “concerns all aspects of the research cycle, from scientific discovery and scientific review to research assessment, publishing and outreach” (European Commission, 2019). One of the most commonly used definitions of open science refers to:

“the practice of science in such a way that others can collaborate and contribute, where research data, lab notes and other research processes are freely available, under terms that enable reuse, redistribution and reproduction of the research and its underlying data and methods.”

FOSTER
— n.d.

Open science is being acknowledged as a top priority in European Union-wide strategies (among others, the “Digital Market” priority and the priority of “Democratic Change” under the European Commission priorities 2014-2019, as well as in the Vision of the new European Commission College 2019-2024). The European Commission structures its open science policy around eight ‘ambitions’ or priorities. The first proposition of the eight priorities appears in a 2018 paper by an external advisors group (Open Science Policy Platform, 2018), leading to a December 2019 publication by the European Commission (European Commission, 2019). Citizen science, which is the focal point of this study, is the catalyst in open science, as it has the potential to “increase the input of knowledge producers into a more Open science environment” (European Commission, 2016, p. 45).

Figure a.
The eight ambitions of open science.



1. Sections 1.1-1.4 are adjusted from Zourou (2020).

1.2 Role of HEIs in open science

Naturally, universities play a fundamental role in the various forms of open science. In the figure above, universities work as catalysts on the institutional level and contribute to “implementing policies, operating services and [offering] support” (Figure 1). It is worth mentioning that open access policies are paramount in the adoption of open science at universities. The European University Association, representing more than 800 universities and national rectors’ conferences in 48 European countries, has issued the publication “Towards Full Open Access in 2020: Aims and recommendations for university leaders and National Rectors’ Conferences” (EUA, 2017). On the country level, the policies adopted by European universities can be found at the EU member state pages collected in the “Open science overview in Europe” provided by OpenAIRE. These pages also highlight examples of European universities having created research data policies and services to support management of research data.

There is a wealth of resources on the role of HEIs in open science, as well as ways of unleashing the potential of researchers in committing to open science. For instance, there is a growing interest in Responsible Research and Innovation (RRI), with leading initiatives such as FIT4RRI², RRI Tools³ and NewHorizon⁴. In addition, OpenAIRE initiatives for training researchers on skills related to open science have been implemented around Europe.

In terms of skills, the importance of HEIs (including academic libraries) in supporting and promoting open science is highlighted in several EU policies. Among them, the 2017 Report of the Working Group on Education and Skills under Open Science (European Commission, 2017b) emphasises the need to shape HE students/next generation researchers as “open science citizens”. More precisely:

“The European Research Area (ERA) should work in closer collaboration with the European Higher Education Area (EHEA) (...), enabling the next generations of researchers to evolve as Open science citizens. (...) New generations of scientists and researchers, as the driving force for innovation and economic growth, are of vital importance to Europe's future competitiveness and leadership.” (p. 16)

EUROPEAN COMMISSION
— 2017b.

2. <https://fit4rri.eu>

3. <https://www.rri-tools.eu>

4. <https://newhorizon.eu>

1.3 Potential of HEIs in citizen enhanced open science

Finally, data stewardship, (Teperek et al., 2018) is a new function adopted by universities to support scientific staff with data management and also to ease the open science pathway. Since 2017, Delft University of Technology (TU Delft) has embarked on an ambitious Data Stewardship project, one which has been adopted and refined by other pioneering institutions. As these topics go beyond the scope of the current study, we will now move to its core topic, namely civic engagement in open science for universities.

Beyond the institutional horizon of each university, open science strengthens the connection to the world outside academia. Citizen-enhanced open science can potentially be a term that broadens open science through the inclusion of citizens in its fabric. Under the priority “Educate for the future and invest in people who will make the change”, the 2017 publication LAB – FAB – APP by an expert group on maximising the impact of EU Research & Innovation Programmes (European Commission, 2017a), claims that:

“Europe’s universities need urgent renewal, to stimulate entrepreneurship and tear down disciplinary borders. Strong non-disciplinary collaborations between universities and industry should become the rule and not the exception. (...) Projects should include training activities for the next generation of researchers and innovators, particularly skills needed for data-driven open science. Whenever possible, citizen science should be encouraged, where citizens become providers and users of data. This will reinforce and give new meaning to the policy of open access to publications and data; this openness should enable citizens and citizen groups to participate in evidence-based policy and decision-making.” (p. 13)

Based on the claim above, the LAB – FAB – APP study urges towards action that provides the opportunity to “stimulate co-design and co-creation through citizen involvement.” (ibid, p. 19) The interest in the citation above resides in the relationship that is drawn between change in universities through innovation partially built on citizen engagement. It also emphasises the role of citizens as providers but also as users of scientific data generated in a more dialogic relation than mere data delivery on the user side. Moreover, it emphasises the role of skills as a crucial component of the university evolution that will be discussed hereafter. This leads us to the definition of citizen science and its connections to closely related concepts.

1.4 Citizen science

Citizen science is not a radically new concept or practice. This section outlines its origins, offers a definition and connects it to related terms that will be used throughout this study.

It is common to situate citizen science under the umbrella term Public participation in scientific research (PPSR). PPSR can be broadly understood as a way to generate scientific knowledge, motivate public engagement with scientific research and advocacy, and provide education about a scientific subject matter (Loss et al., 2015). According to Bonney et al. (2009), PPSR is designed to:

actively involve the public directly in the multifaceted and iterative processes of scientific investigation. Such efforts include citizen science, volunteer monitoring, and participatory action research. Projects that fall into these categories allow participants to learn both science content and process while experiencing the fun and excitement of research. (p. 10).

BONNEY ET AL.
— 2009.

Regarding the definition of citizen science, there is a wealth of understandings, which reflects the growing interest in this field of studies. Eitzel et al. (2017) offer a panorama of available definitions by reviewing the theoretical, historical, geopolitical, and disciplinary context of citizen science terminology. Shanley et al. (2019b) provide an inventory of citizen science definitions. Other attempts to critically address citizen science are made by, among others, Vélot (2016) and Strasser et al. (2019). Related terms exist, such as participatory research (English, Richardson & Garzón-Galvis, 2018; Göbel, 2019), citizen engagement in science and policy (Figueiredo Nascimento, Cuccillato, Schade & Guimarães Pereira, 2016), public engagement with science and technology, community-based research, do-it-yourself (DIY) research and citizen inquiry. Herodotou, Sharples, and Scanlon (2018). The plethora of terms can be considered as a healthy sign of a field in full evolution.

Regarding the meaning of citizen science that will be adopted in this study, we opt for a definition that situates the term within the realm of open science and its results that is relevant and meaningful to the advancement of (open) science. Based on this understanding of the term, it is not only the dimension of public engagement in the process of scientific research that is fundamental (as it is the case of most definitions of PPSR), but also the fact that citizen science “requires at least a basic degree of openness” (DITOs consortium, 2017).

The emphasis of citizen science on releasing publicly available data is manifested in the ten principles of citizen science, produced by the European Citizen Science Association (ECSA, 2015). Principle #7 states that “citizen science project data and meta-data are made publicly available and, where possible, results are published in an open access format”. Seen from this perspective, efforts should be made so that “many citizen science projects make the data they generate accessible to some degree or contribute to the development of freely (re)usable research tools and methods” (ibid).

According to Vohland and Göbel (2017), core concepts of open science include the large digital infrastructures, publication systems and altmetrics, while the core concepts of citizen science are social inclusion, scientific citizenship and sustainability. Areas of synergy between open science and citizen science where the two concepts coincide include the participation of volunteers in research and the accessibility of research results and processes.

Along the same lines, Dörler and Heigl (2019) claim that “all data and results of a given citizen science project [should] be published open access, provided there are no legal or ethical barriers to doing so. In our view, this is an important step toward increased transparency and trust in citizen science projects”. Although this understanding of the term limits its reach and practices, we argue that this is a way for citizen science to situate itself as a dynamic component of the open science endeavour that facilitates the cooperation between scientists and volunteers.

The term “citizen-enhanced open science” has been proposed (Zourou, 2020) to highlight the interrelationship between the two key concepts and the value of citizen to open science.

This would potentially scale up citizen science by making the results more transparent and sharable, that is essentially needed to address global societal topics, such as the United Nations Sustainable Development Goals (SDGs). Citizen science has the potential to contribute to social and environmental challenges such as those depicted in the SDGs (Fritz et al., 2019) but some standardisation is needed (De Pourcq & Ceccaroni, 2018). In this respect, the FAIR data principles (Findable, Accessible, Interoperable, Reproducible, (Wilkinson et al., 2016)) can be a possible path towards this goal.

With respect to the term “citizen”, Eitzel et al. (2017) offer a detailed analysis of concepts used to describe non-academic participants in science (amateur, layperson, volunteer, etc.) and the intricacies in defining their status and contribution, but also their rights in a scientific endeavour. What is important to mention in relation to the present study is that, as citizen science projects gain complexity, so do the roles adopted by citizens. This can also involve highly skilled volunteers with specific areas of expertise who cater for crucial stages of a project. For example, in Epidemium, one of the 20 projects analysed in this study (chapter 2), along with mainstream volunteer contributions, specific scientific expertise has been sought “where professionals with expertise deemed useful for the advancement of projects (...) They are there to answer questions and thus make the research process more fluid”. (Tauvel-Mocquet, 2018, p. 67). Thus, the term “citizen” should not disguise the wealth of roles, competences and skills present within projects, the orchestration of which is a key feature of the design of a project. This point will be addressed in relation to roles that HE staff can play during several stages of a citizen science cycle.

Finally, although citizen science gains traction in both the scientific as well as in the policy agenda, it should be kept in mind that it is a field in full evolution. Undoubtedly, we are far from reaching a consensus on the aim and processes to adopt with respect to citizen science on the international level. A scholarly debate that originated from the 2019 paper by Heigl et al. (2019a), commented on by Auerbach et al. (2019) and responded to by Heigl et al. (2019b) is indicative of the still numerous open issues to tackle.

1.5 Related terms: open knowledge and crowdsourcing

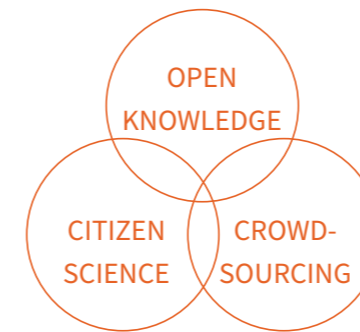


Figure b.
Related terms of open science and citizen science concepts.

An overview of open science and citizen science concepts would be incomplete without referring to two closely related terms, open knowledge and crowdsourcing. Open knowledge is understood as “any knowledge (either embodied in artefacts, in social practices, or in research outputs) that is freely circulated – without any legal, technological or social restriction” (Open Knowledge Foundation, nd).

Within the context of open science, distributed social participation, the term crowdsourcing was coined by Howe (2006) and refers to the engagement of individuals who voluntarily offer their knowledge to a knowledge seeker (such as a social group, an organisation, a company, etc.). Crowdsourcing implies favouring the commitment of motivated users in the production process. Depending on the context, it can not only be seen as a movement towards massive user engagement in an unrestricted and collaborative manner, but also as a means by which companies exploit users' collective efforts of knowledge building, without corresponding remuneration, “[by] tap[ping] the latent talent of the crowd” (Howe, 2006).

Crowdsourcing has been analysed from an educational perspective (Paulin & Haythornthwaite, 2016; Zourou & Potolia, 2021) as well as for its potential in citizen science, namely for its affinities with user involvement in PPSR. The term “crowd science” has been used to some extent (Scheliga, Friesike, Puschmann & Fecher, 2018). As both crowdsourcing and citizen science are fuelled by voluntary participation to an open call for participation, several authors claim that “[t]he defining characteristic of both citizen science and crowdsourcing, however, is their location at the point where public participation and knowledge production – or societal context and epistemology – meet, even if that intersection can take many different forms” (Shanley, Parker, Schade & Bonn, 2019a, p. 1).

In this vein, the emphasis is given more to a unified approach of citizen science and crowdsourcing than to differentiating features between the two methods. Citizen science and crowdsourcing projects can display various degrees of openness and scholarly rigor; these nuances are worth considering when analysing volunteer engagement in an open call for participation, which is the convergence point between citizen science and crowdsourcing. If the project is in line with the open science principles, access to the result of the activity belongs to the knowledge commons (or at least it is expected to), with reference to open access and re-use of the scientific result achieved through the citizen science or crowdsourcing activity. Citizen participation is expected to give voice to those needed (cf. environmental justice citizen science or crowdsourcing projects) and to provide a means for those likely to be excluded (by the decision-making process).

1.6 Citizen science typologies

As different interpretations may arise in light of the dynamics of citizen science, any attempt at categorisation should be considered indicative. However, there is a wealth of typologies to describe the forms citizen science projects might take.

To capture the nuances of citizen science, a group of scholars belonging to the EU-Citizen.Science project launched a survey in 2019 with the aim of understanding which activities, and under which conditions, should be considered to be citizen science. The team presented different cases and asked the audience to what degree the case described to them could be labelled as a citizen science activity. The exercise per se reflects the complexity of categorisation of citizen science activities (Haklay et al., 2021).

BONNEY ET AL. TYPOLOGY (2009)

One of the first typologies is provided by Bonney et al. (2009). It has been adopted by Tweddle, Robinson, Pocock, & Roy (2012) in their analysis of biodiversity in citizen science projects and will also be employed within the framework of our analysis (cf. 2.1). More precisely, Bonney et al. (2009) identify three major categories, namely contributory projects, collaborative projects and co-created projects.

3 Citizen Science Categories



CONTRIBUTORY PROJECTS

which are generally designed by scientists and for which members of the public primarily contribute data.

COLLABORATIVE PROJECTS

which are generally designed by scientists and for which members of the public contribute data but also may help to refine project design, analyse data, or disseminate findings.

CO-CREATED PROJECTS

which are designed by scientists and members of the public working together and for which at least some of the public participants are actively involved in most or all steps of the scientific process". (Bonney et al. 2009, p. 11).

HAKLAY'S TYPOLOGY (2015)

Another widespread typology is provided by Haklay (2015), who identifies six types of citizen science initiatives, from the most rudimentary to the most sophisticated ones:

6 Types of Citizen Science Initiatives

PASSIVE SENSING

where participants use available sensors (e.g., in smartphones).

VOLUNTEER COMPUTING

in which participants donate the unused processing power of their computers and devices.

VOLUNTEER THINKING

in which participants engage in cognitive tasks to assist scientists.

FULL-SCALE ENVIRONMENTAL AND ECOLOGICAL OBSERVATIONS

PARTICIPATORY SENSING

CIVIC AND COMMUNITY SCIENCE which include active engagement in building and deploying scientific tools and methods.

TURBÉ ET AL. TYPOLOGY (2019)

In their 2019 study on environmental citizen science projects of high policy relevance, Turbé et al., inspired by Haklay's 2015 paper, identify seven citizen science types:

7 Types of Citizen Science

PASSIVE SENSING

VOLUNTEER COMPUTING

CROWDSOURCING

OCCASIONAL REPORTING

MONITORING

CIVIC SCIENCE

DIY ENGINEERING

Other suitable typologies are provided by Herodotou (2018), Scheliga et al. (2018), Bonney et al. (2013) and Schaefer and Kieslinger (2019).

SOCIENTIZE TYPOLOGY (2014)

For the needs of this study we will employ the "models of citizen engagement in science", provided by the Socientize group (Sanz, Holocher-Ertl, Kieslinger, García & Silva, 2014), which include the items: pooling of resources, data collection, analysis tasks, serious games, participatory experiments, grassroots activities, collective intelligence. We opted for this typology as its items are clear-cut, and, as Dörler and Heigl mention (2019), there is a lack of hierarchisation of the contribution by citizens.

7 Models of Citizen Engagementt in Science

POOLING OF RESOURCES

acquiring assets from citizens (e.g. for heritage collection enhancement)

DATA COLLECTION

where users are involved in compiling data or in presenting findings

ANALYSIS TASKS

involving tasks as transcribing, validating and folksonomy

SERIOUS GAMES

where people collect data by playing computer games

PARTICIPATORY EXPERIMENTS

where tasks are principally designed on the basis of experiential citizen participation

GRASSROOTS ACTIVITIES

where the scientific project is sometimes actively carried out by communities of practice

COLLECTIVE INTELLIGENCE

where different people critically inspect a large amount of data that can lead to decision making



Chapter 2: Citizen enhanced open science in cultural heritage

Building on the panorama view on citizen enhanced open science in chapter 1, this chapter further situates it in the cultural heritage field. We first introduce citizen science in the broader sector of SSH (2.1), we then narrow down to the cultural heritage field (2.2). Emphasis will be laid on a dimension of openness for cultural heritage institutions, namely GLAM (2.3) and its ethical implications (2.4).

2.1 Citizen science in Social Sciences and Humanities (SSH)

This chapter outlines the basics of citizen science in SSH, briefly reviewing prevalent critical aspects, advancements and challenges in the current landscape. Burgeoning citizen science projects in SSH have been leveraging new objectives, methodologies and benefits within the various disciplines, sharpening the role of citizens as researchers and making SSH scholarship more accessible to the public. Contemporary terms designating citizen science in the SSH include citizen humanities (Heinisch et al., 2021) and citizen social science (Albert et al., 2021). The field of SSH also encompasses the arts (humanities, arts, social sciences - HASS), where the concept of participatory art-based research is common, referring to the artistic research process rendered public and directed towards social change (Leavy, 2018; Nunn, 2020). However, citizen science has been less visible within the SSH, as opposed to such fields as natural or biomedical sciences, while some disciplines in the SSH have rarely been part of citizen science (Tauginienė et al., 2020), such as philosophy, political science and religion. Another barrier faced is that citizen science in SSH has limited references in the academic literature and has been largely understudied.

Although there are many parallels with issues faced in citizen science in the natural sciences (such as data management, authorship, and policy), many challenges are specifically bound to SSH, including insights for evaluation in the field, quantitative data and assessment of outcomes, which are more challenging due to the often diverse, non-easily measurable qualitative dimensions of SSH-related citizen science data, producing outcomes that may be difficult to evaluate as a service or a product (cf. Kieslinger et al., 2017; Albert et al., 2021; Prats Lopez, 2017). In addition, more critical views are needed for a better understanding of the concept and legacy of citizen science within the SSH, in relation to other existing similar terms and participatory methods developed within subfields, cf. public sociology, public history (Burawoy, 2005). Currently, there are several concepts and terms being debated, which designate types of knowledge co-creation between scholars and citizens in the broader humanities fields, including terms such as citizen historians and citizen archivists.

CITIZEN SCIENCE IN SSH AS IMPETUS FOR SOCIAL ACTION

The definition of citizen science in the SSH has its underpinnings in existing concepts around public participation in scholarly research (PPSR) which have been around for a while. In particular, the term inclusive research has been used as a generic term indicating democratisation of research at large (Nind, 2017). Participation action research (PAR) has been broadly used within the social sciences, which is defined more as a practice guided by principles rather than a comprehensive methodology, for conducting social research that includes non-expert participants (McTaggart, 1996). In addition, PAR has been criticised as inclining more towards activism rather than research (Cahill, 2007). It is argued that citizen science can consolidate the rather complex approaches under PAR, “rendering them more readily usable, recognisable, and comparable” (Albert et al., 2021). The evolution of citizen science within the SSH and beyond has shown that the term is able to integrate diverse forms of participation, multiple modes of public engagement and new technologies, including that of digital action (DA) -defined as digitally supported action of social and political campaigning that use digital network infrastructures- as framed recently within the HEIDI study (Zourou, 2021).

An overview of the methodologies employed by citizen science initiatives arguably related to SSH, reveal a variety of creative approaches, which include ethnographic digital storytelling, social dialogue, critical research, qualitative phenomenological research methods (open-ended interviews), qualitative empirical research, “anthropological approach” with face-to-face interviews, document analysis and interviews, “recreational monitoring” approach and more (Tauginienė et al., 2020). Mixed methods studies have also been developed bridging scientific disciplines

within the SSH, including a niche of cross-disciplinary humanities and STEM-related projects that apply multimethod research practices (Fischer et al., 2021). In addition, emerging methodological frameworks include the novel research forum, which aims to stand as a communicative space for co-creation in citizen social science projects, empowering citizen participants as co-researchers and emphasising the co-creational and co-designed research dynamics in citizen social science (Thomas et al., 2021).

INDICATIVE INITIATIVES

A number of European funded projects have addressed the prospects of citizen science research in the SSH. Some of them are outlined here, on an exclusively indicative, non systematised basis. The CoAct project⁵ promotes multi-stakeholder bottom-up collaborations with citizens as co-researchers, aiming to establish a theoretical and methodological framework for citizen social science, in order to achieve transformative and sustainable impact. The Accomplish Project⁶, advances co-creation in conceptual and practical terms, producing guidelines and publishing good practices for the development of co-creation projects in present knowledge economies and within the quadruple innovation helix framework (university-industry-government-public). The YouCount project⁷ emphasises citizen social science as a means to empowering youth and co-creating social innovations and policymaking.

Public participation opportunities in research are reinforced through the use of ICT, expanding the prospects of social innovation and social transformation within the SSH as well (Schäfer & Kieslinger, 2016; Dobрева & Azzopardi, 2014). These can take the form of ICT specifically designed for supporting SSH-related citizen science projects and their research communities of professionals and amateurs (pro-am), on the basis of existing infrastructures as CLARIN⁸ for digitally-enabled research and teaching in the arts and humanities, OPERAS⁹ that could provide integrated social networking technologies for connecting professional researchers with citizen scientists, and collaborative open data management services by EUDAT’s B2Drop repository that could allow humanities data sharing among expert and non-expert researchers. In this context, digital infrastructures for citizen science in the SSH are not fully established, but are in active development of more user-friendly interfaces, automation processes, services and participatory frameworks in directions such as collaborative citizen data management and participatory scholarly project design.

5. Co-designing Citizen Social Science for Collective Action - CoAct, <https://coactproject.eu>

6. ACcelerate CO-creation by setting up a Multi-actor PPlatform for Impact from Social Sciences and Humanities - ACCOMPLISSH, <https://www.accomplish.eu>

7. Youth Citizen science, <https://www.youcountproject.eu>

8. Common Language Resources and Technology Infrastructure - CLARIN, <https://www.clarin.eu>

9. Open scholarly communication in the european research area for social sciences and humanities - OPERAS, <https://www.operas-eu.org>

2.2 Citizen science in Cultural Heritage

Efforts to compile a historical overview of public engagement in cultural heritage-related research has brought forth several bottom-up initiatives from the 18th - 19th century and more recent European policies and programmes. Heinisch et al. (2021) point out how the private engagement of individuals played a crucial role in the institutionalisation of heritage bodies and the establishment of today's known humanities' disciplines, referring specifically to the work of J.J. Winckelmann in the 18th century as the endeavour of a citizen scientist. The Dictionary of Mediaeval Latin has been referred to as one of the longest running citizen science projects in the cultural field, which has resulted in more than 100 years of public participation for its compilation (Heinisch, 2021; Dobрева & Azzopardi, 2014).

Public participation in cultural heritage with a focus on scholarly evidence has been supported in the past decades through policy documents and programmes that prompted participatory practices (UNESCO, 2003, 2012; Faro, 2005). Towards this direction, the report of the Open Method of Coordination (OMC) working group "Participatory Governance of Cultural Heritage" (European Union, 2018) addressed practical advice and strategic resources for developing participatory processes in the cultural heritage field, mapping public policies, gaps, impact and providing a historical overview of the milestones concerning the participation of civil society in cultural heritage on a policy level. The project Civic Epistemologies¹⁰ further elaborated on these terms addressing citizen science in digital cultural heritage and the humanities. A roadmap was released, examining the definition and practical implementation of digital infrastructures and the potential of citizen science in the age of digital culture (Jennings et al., 2015).

The range of infrastructural support for citizen science in the humanities with a focus on the cultural heritage field has been further examined in the PARTHENOS project, "Pooling Activities, Resources and Tools for Heritage E-research Networking, Optimization and Synergies"¹¹ (2015-2019). The findings were presented in the form of learning outcomes through the online training module "Citizen Science in the (Digital) Arts and Humanities"¹². The project stressed the crucial role of research infrastructures in optimising scholarly knowledge co-creation between professional and citizen scientists, providing access to key resources and making them easily discoverable (like tools and services to connect, analyse and store data), offering open data through open-access databases and corpora, developing

digital environments in the form of software and designing training modules for research skills development. An early reference on "users involvement" as key success factor for the European competitiveness and research in the domain of digital cultural heritage, has been the Green Paper publication DC-NET project (European Commission, 2011b):

"The involvement of the users in each phase of the research, development and innovation processes is a determining factor for the success of the new ventures. Users should be actively involved into pilots, awareness and training activities possibly on a regular basis, in each project".

EUROPEAN COMMISSION
— 2011b

The Civic Epistemologies roadmap publication (Jennings et al., 2015) has highlighted the potential for increased interaction among researchers, citizens, artists and IT professionals, not only as a means to bring social innovation but also for scoping out needs for sustainable community development and engagement, improvements in terms of searchability, discoverability and in openly sharing, shaping and embedding citizen research contribution in the humanities and cultural heritage related scholarly knowledge contexts.

The emphasis on the development of digital infrastructures that enable active public participation in cultural heritage research, has raised awareness on ethical issues and open data practices regarding the design, management and publication of citizen science projects. In this context, data assurance becomes a critical issue in terms of sustainability and integrity in citizen science within cultural settings and beyond (Haklay, 2021). As pointed out, data quality in the humanities and consequently in the cultural heritage field is more challenging (Prats Lopez, 2017), due to the often interpretive and not easily quantifiable nature of cultural data. In order to better validate citizen science contributions as scholarly output, compliance with scientific quality standards should be taken into account. More effort should be put into identifying discipline-specific good practices of citizen science in the cultural heritage field. While certain good practices regarding a broader ethics-in-action framework are addressed in the following subsections (i.e. OpenGLAM, CARE principles), the point is made for overcoming challenges related to the scalability and sustainability of citizen science projects, documentation of impact and provision for further open metrics.

10. www.civic-epistemologies.eu

11. <http://www.parthenos-project.eu>

12. <https://training.parthenos-project.eu/sample-page/citizen-science-in-the-digital-arts-and-humanities/>

2.3 Open access policy in GLAMs

The call to widen access, sharing and reuse of cultural heritage is part of a continuing effort towards a better understanding of open-access among GLAMs (Galleries, Libraries, Archives and Museums), and tackling of their needs and opportunities in web environments. Extensive digitalisation processes of the past three decades have aggregated a rich, expanding inventory of digital cultural heritage assets that leads digital transition and is discussed within EU and international policy and legal regulatory frameworks.

Accessibility in cultural heritage has been a key issue in several EU policy papers; The Commission Recommendation on the digitisation and online accessibility of cultural material and digital preservation (European Commission, 2011a) established a groundwork towards an effective policy and legal reform for enhancing accessibility of digitised heritage material, recommending, among other, “cross-border accessibility” of works in the public domain, “promoting the widest possible access to digitised public domain material” and addressing key criteria: “partnerships models where the end-user has free access to the digitised material should be encouraged over models where the end-user has to pay for accessing the material”.

In this context, the digital conference by Europeana “Recommendations on Copyright and its role in the Digital Transformation of the Cultural Heritage Sector” (Europeana, 2021) has been gathering additional recommendation points based on an insightful problem statement that addresses issues such as the urge to update copyright frameworks that are not fit for the digital age, copyright protection as barrier for the fulfilment of the mission of cultural heritage institutions, while tackling also the need for a balanced approach between the fair use of artworks that allow artists a fair remuneration, and the possible negative consequences of copyright protection for the cultural heritage sector, such as barriers to access. Several other reports have been corroborating the call to an effective copyright reform towards openness (Caso et al., 2021), attempting a legal mapping of different categories that are part of the cultural heritage preservation landscape, such as public domain works, orphan works and out-of-commerce works, for which cultural institutions would benefit from more solid and cross-border standardised frameworks for making digital content more accessible.

While addressing accessibility at large for cultural heritage, the term of “open-access” to describe enhanced accessibility in the field has not been explicitly adopted in the grey literature of government bodies (cf. in reports, evaluations, recommendations) so far. However, an active part of supporting openness in digital heritage is embodied in non-binding instruments (cf. guidelines, statements and good practices) carried out by several actors in the field, which have not been systematically mapped so far and can be critical for future research. In this context, terms that have been populated include GLAMs, sometimes also GLAMA with the addition of academia, open GLAM and open-access. In this context, openness draws its definition on the Open Knowledge Foundation’s (OKF) Open Definition with its succinct statement “Open data and content can be freely used, modified, and shared by anyone for any purpose” (n.d.).

An indicative, data-driven insight into the current open-access landscape in the GLAM sector is provided by the ongoing “Survey of GLAM open access policy and practice” (McCarthy & Wallace, 2018). More than a thousand GLAMs internationally that advocate for open access have been enlisted up to date. The survey provides overarching facets that index open data licensing and publishing among GLAMs, registering their openness scope through, among others, their institution Wikidata instance, terms of use, application-level query systems (API’s) and their open data source on external platforms as e.g. Wikimedia, Trove, Europeana, Flickr. The “Survey of GLAM open access policy and practice” was uploaded on the platform Copyright Cortex (2019), an open platform that functions as a resource for issues related to digital cultural heritage, openness and copyright, with expert commentary and information targeted for use by memory institutions.

INDICATIVE INITIATIVES

An indicative selection of EU and international resources (cf. non-binding instruments, initiatives) that address open-access in cultural heritage are presented as following:

The OpenGLAM principles developed within the Open Knowledge Foundation (OKF) in 2013 by the OpenGLAM Working Group, are considered a point of reference. The principles, referred to as a community effort, integrated early references on data discoverability, open access for GLAM-related metadata and strongly encouraged GLAMs to pursue opportunities to engage audiences in novel ways by allowing users “to enrich and improve metadata by leveraging crowdsourcing applications”. The OpenGLAM principles can stand as an early advocate of openness, machine-readable data and public participation in cultural heritage, communicating exemplary statements from leading institutions which define a starting ground of good practices to this end.

OpenGLAM¹³ was born as an initiative around 2010, when the Open Knowledge Foundation received a grant from the European Commission as part of the DM2E (“Digitised Manuscripts to Europeana”) (OpenGLAM, n.d.). The Open GLAM movement has tried to bring some of the concepts and values of the “open” movement to the GLAM sector. OpenGLAM has been promoting a declaration on open access for cultural heritage, open to public consultation (Heidel & Wallace, 2020). This includes new areas of focus as GLAM-Generated IP, User-Generated IP, Privacy/Sensitivity and Technical Standards. It also addresses fields as intangible cultural heritage, decolonisation and indigenisation.

The OpenGLAM initiative has been supported by the Creative Commons organisation, which has initiated the CC Open Culture Platform (former Open GLAM Platform) (2020) “providing a space to share resources, enhance collaboration and raise awareness on open access to digital cultural heritage, working with GLAM professionals and open advocates”¹⁴.

Among its funding opportunities, the Open Culture Platform expanded with a global perspective on covering open GLAM stories in underrepresented communities; a call for writing and publishing stories was set¹⁵, documenting good open GLAM participatory practices from Africa and other under-represented regions, with a final selection of 16 stories being published on the Open GLAM blog on Medium (). As evident, cultural heritage is being increasingly revitalised through open platforms and digital infrastructures by global GLAM communities in which OpenGLAM fosters public engagement.

13. <https://openglam.org>

14. <https://network.creativecommons.org/cc-openculture-platform>

15. <https://network.creativecommons.org/call-for-stories-open-glam-in-underrepresented-communities/>

The Hack4OpenGLAM¹⁶, developed by Susanna Ânäs (AvoingLAM), the Creative Commons Open GLAM platform and Wikimedia Finland, is a hackathon for cultural heritage and public participation that is being implemented in the annual CC Summits since 2020, gathering a wealth of Open GLAM initiatives related to digital cultural heritage and an international community of open GLAM advocates.

The GLAM-WIKI initiative¹⁷ and community has been supporting GLAMs and other related institutions to work with Wikimedia (GLAM-WIKI, 2011). A core of strategies, model projects and case studies based on good practices have been implemented on digitisation and digitised heritage collections, showcasing innovative workflows and working solutions for creating open cultural heritage data and enriching Wikimedia Commons through public participation. Supported projects span internationally and include, among others, cultural metadata improvement, tool development for content integration to Wikimedia (i.e. batch upload and data preparation), public co-curation activities on cultural heritage content and contextualisation of Wikimedia through edit-a-thons for new Wikipedia article creation by the public.

Finally, a curated set of resources on Open GLAM is provided by the “Open GLAM now!”¹⁸ webinar series produced by Larissa Borck as part of the Swedish National Heritage Board (2019). The project covers several aspects of digital cultural heritage in relation to openness in GLAMs, including, among others, applied cases and scholarship on linked open data, user-generated content and legal aspects in licensing.

2.4 Ethical (re)use of cultural data in citizen science

This section aims to chart resources around citizen science that concern ethical issues in the context of cultural heritage, suggesting an interdisciplinary approach in the areas of governance and administration within applied contexts and theoretical contextualisation. It also aims to raise awareness towards an ethics-in-action framework that may include principles, rules, norms, values and standards, further supporting openness and ethics in cultural heritage, in order to inform open science practices that include a citizen science dimension. Lastly, topics for further investigation or development are outlined, currently lacking from the literature, as the field of ethics in cultural data management within citizen science seems to be

16. <https://hack4openglam.okf.fi>

17. <https://outreach.wikimedia.org/wiki/GLAM>

18. <https://www.raa.se/in-english/events-seminars-and-cultural-experiences/previous-conferences/open-digital-heritage/open-glam-now>

less explored.

The “10 principles of Citizen Science” render an ethical and flexible framework that is applicable across different disciplines and settings. The 10th principle addresses “issues surrounding copyright, intellectual property, data sharing agreements, confidentiality, attribution, and the environmental impact of any activities” (ECSA, 2015). Using this reference as an indicative guide, a selection of resources is presented below for these topics.

Intellectual property (IP) and copyright considerations can be foresighted for citizen science research input/output. An effective typology has been developed in this context by Teresa Scassa and Haewon Chung (2015), involving four broad categories that can benefit from management in intellectual property within citizen science projects: a) classifying or transcribing data, b) collecting data, c) humans as research subjects and d) social engagement with data. Further consideration on ownership, inventorship and authorship of data is being addressed for drafting a participatory research plan. The article further maps potential IP issues and provides concrete examples from citizen science projects.

A comprehensive work on research data specialised in cultural heritage (material and immaterial) is being conducted within the NFDI4Culture project (Altenhöner et al., 2020). The consortium aims to form a professional and nation-wide research data management strategy for cultural data in Germany. Citizen science is acknowledged as a source for working concepts and terminologies on research collaboration. However, the project stresses the scarcity of training opportunities and acknowledged quality criteria or frameworks for cultural data management in general.

Research ethics is a component of the Responsible Research and Innovation (RRI) European policy. Relevant topics include the rules of engagement and respect in citizen science partnerships with communities and their members, social justice ethics referring to diversity and inclusive cultures between citizens and society, trustworthy data practices, best practices in scholarly public network of key actors in which civil society is included, build a new path for an ethical governance framework. In particular, research integrity should be a key value aligning research to social values. In addition, a plurality of actors should be included in research, as the involvement of citizens can minimise risk and maximise the benefit of developing ethically acceptable research. The RRI Tools project¹⁹ offers a rich set of

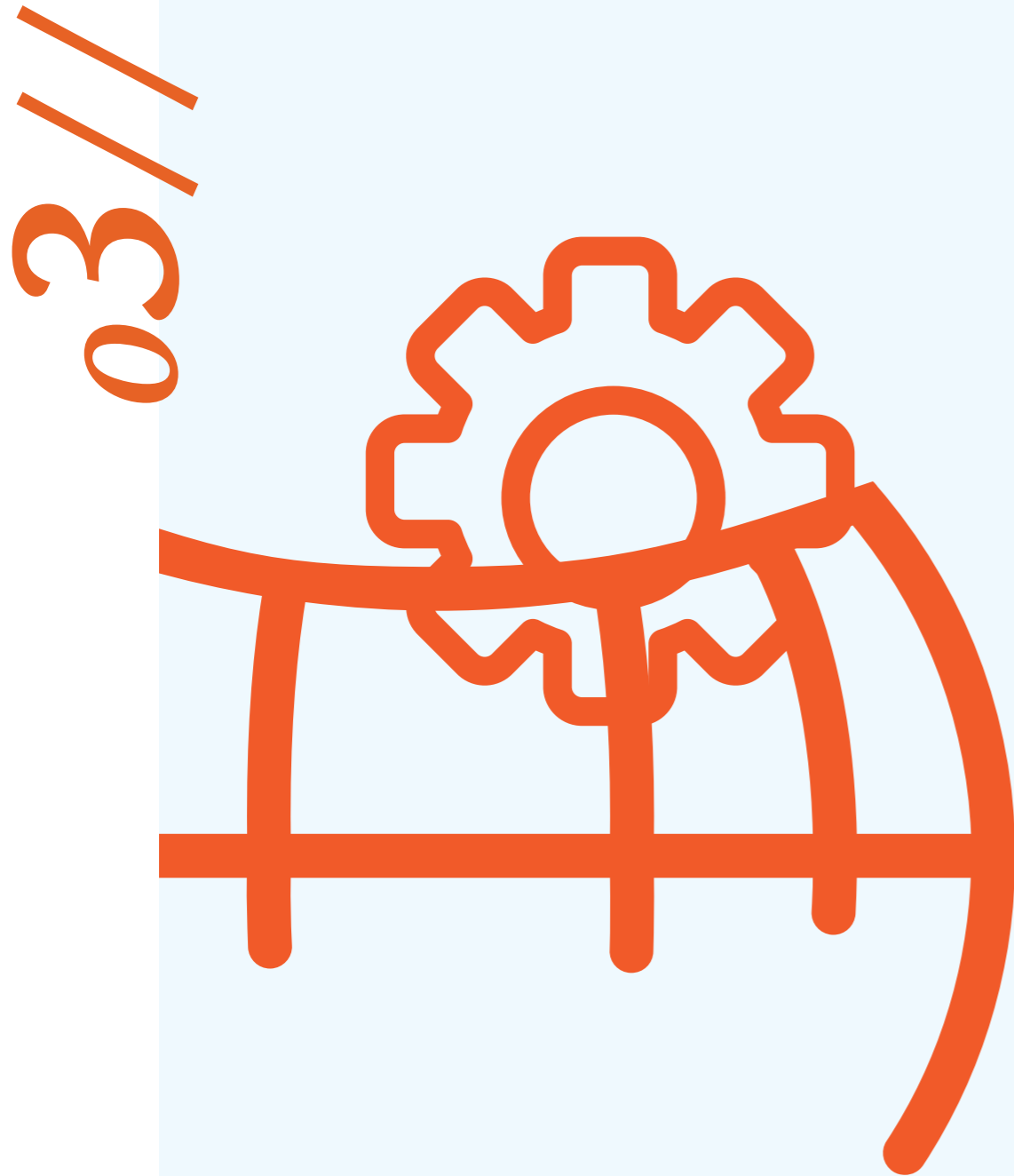
19. <https://rri-tools.eu>

instruments and research results on RRI adoption (2017).

In addition, in terms of data governance and ethics, the CARE principles (Collective benefit, Authority to control, Responsibility, Ethics) promote people-oriented data practices, particularly for the ethical representation and participation of communities and Indigenous people in the governance of data related to them (Carroll et al., 2020). The principles stand for Indigenous data sovereignty, for access and (re)use of digital assets that are Indigenous, promoting equitable participation in data stewardship decisions, reuse and data governance protocols. The CARE principles aim to build upon mainstream data rules of conduct, as the Open Data Charter principles (ODC, 2015) and the FAIR Principles, for findable, accessible, interoperable and reusable data (Wilkinson et al., 2016).

Bringing data governance and ethics to an applied framework of fieldwork research and development, the open-source Sapelli technology was introduced by the Extreme Citizen Science group (ExCiteS) at UCL. It aims to facilitate collaboration with Indigenous people and communities of practice in “extreme citizen science” projects, which stand for collaborative research that empowers people and values their knowledge in co-creating activities. By following a stepwise approach, the Sapelli workflow starts with protocols established between communities that are in social imbalance and of different means (e.g. scientists - non-literate community members), implementing a “Free, Prior and Informed Consent” process (Lewis, 2012), involving a participant-centred design. Although Sapelli has been principally used for tackling social issues, its use in the cultural heritage field could be considered, especially in connection to traditional or local knowledge.

Finally, the concept of sustainable digital infrastructures and the objective of a reduced environmental impact is being addressed. In this context, the Research Libraries UK (RLUK) has released the Digital Shift Manifesto, communicating a cohesive plan of goals and challenges, advocating for environmentally sustainable infrastructures and for the creation of an inclusive space (RLUK, 2020). However, the sustainability of digital infrastructures is a sparsely examined topic, particularly in connection to citizen science in cultural heritage. In addition, the concept of an observatory on ethical issues in citizen science is briefly being addressed, for the evaluation of sustainability and ethics in CH citizen science projects, including digital ethics.



Chapter 3: Methodology

METHODOLOGICAL STEPS

This chapter describes the methodology adopted in the identification and selection of initiatives whose analysis contributes to the understanding of citizen science in the cultural heritage field and the role of universities in its sustainability. The chapter is structured according to the methodological steps taken, namely:

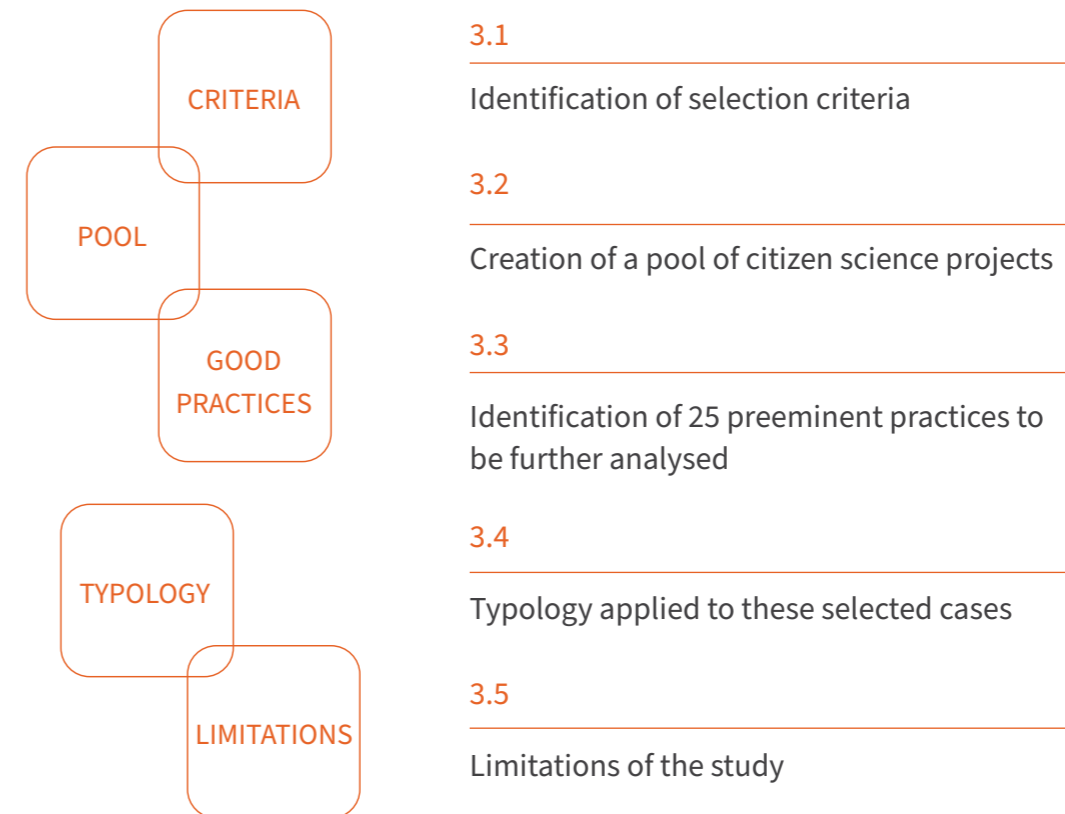


Figure c.
Methodological
steps taken.

Methodology

Desktop research and survey

Identification of citizen science practices

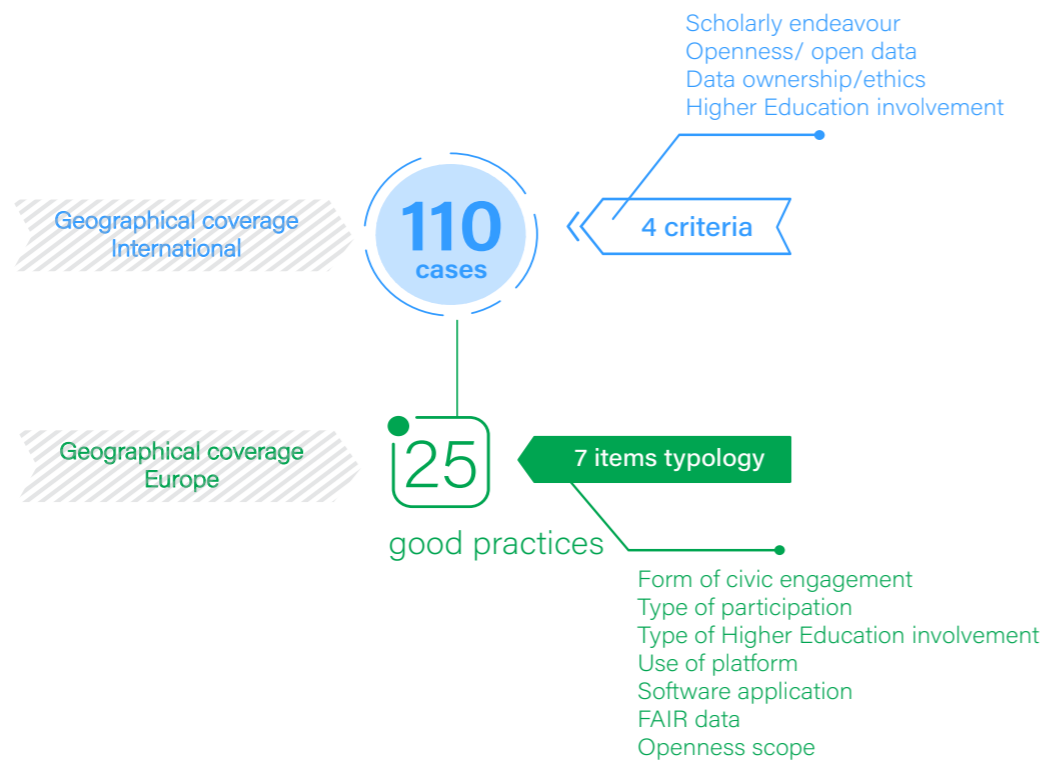


Figure 1. Methodology of the CitizenHeritage study describing the consecutive steps and selection criteria for the identification of citizen science practices within the scope of the study (infographic). CC BY-ND 4.0.

3.1 Step 1: Identification of selection criteria

Four selection criteria have been set, each based on the conceptual pillars that the study opts for.

3.1.1 The definition of citizen science as belonging to a broader scientific endeavour

Among several definitions of citizen science (see Eitzel et al., 2017; Haklay et al., 2021) we adopt the one by the European Citizen Science Association (ECSA), having released the “10 Principles of Citizen Science” in 2020 (ECSA, 2020), based on an initial version in 2015. With few variations, the same set of criteria is adopted by the Australian Citizen Science Association (ACSA, 2018).

A core feature of ECSA’s definition, which is the reason for its adoption in the present study, is the inclusion of a citizen science project as part of a broader research project that shapes it; in the 2015 ECSA definition, “citizen science projects actively engage citizens in scientific endeavour that generates new knowledge or understanding” (our emphasis) and “citizen science projects have a genuine science outcome”. In the updated 2020 version, the same principle exists:

“What counts as scientific research? In common with scientific research in general, citizen science can address a topic that is basic or applied, inductive or deductive, local or global (...). To ensure rigour, the research should aim to follow protocols and practices in line with the disciplines within which the research is framed.”

EUROPEAN CITIZEN SCIENCE ASSOCIATION (Haklay et al.)
— 2020

Thus, the understanding of citizen science as a component of an overarching scholarly endeavour is important in two ways. First, because it emphasises its alignment to scientific methodologies and approaches of a given discipline, thus strengthening its scientific grounding. Second, because it puts into perspective a citizen science project by placing it in the large picture of scientific work, thus disconnecting it from possibly “utilitarian” forms of public participation in scientific research, or other forms of citizen engagement (e.g. crowdsourcing) that do not feed into a scholar project. Crowdsourcing can be seen as a form of citizen science but only if it supports and strengthens a scholarly endeavour (cf. “What counts as scientific research?” above). Although this definition may seem restrictive, it is strategic to positioning citizen science in the broader context of the Open Science framework. It thus reinforces overarching scholar and policy attempts to connect open and citizen science (cf. 1.2). This is also emphasised by Vohland and Göbel (2017, p. 22) who highlight these connections as a means for citizen science data and practices to leverage open science efforts at large.

This conceptual approach is fully adopted in the present study and leads to the identification of:

SELECTION CRITERION #1
Citizen science projects actively engaging citizens in scientific endeavour

3.1.2 Openness/open data

Another important dimension of citizen science that prevails in the current study as a selection criterion, is, in line with the citizen and open science connection, the re-use potential of data resulting from citizen science projects. Along these lines, “citizen science project data and meta-data are made publicly available and, where possible, results are published in an open-access format” (ECSA, 2015). This is further elaborated in the 2020 version:

Citizen science, scientific, academic and policy-oriented research can include different forms of data and knowledge generation, including novel data generation, creation of new analyses, or production of new knowledge in written and other forms. The knowledge produced in such projects should aspire to disciplinary standards, such as appropriate data quality and quality assurance, the peer review of project publications and materials, or policy-relevant evidence that is fit for decision-making.

EUROPEAN CITIZEN SCIENCE ASSOCIATION (Haklay et al.)
— 2020

As a result, in our study we will adopt:

SELECTION CRITERION #2
Citizen science projects containing dimensions of openness/open data

3.1.3 Data ownership/ethics

Full transparency of data ownership (unless restrictions about privacy apply) is important in citizen science projects. The aims and intentions of citizen science projects and the research they involve should be communicated clearly and openly with participants and other stakeholders. If involvement is consensual and fully understood by participants, it may be considered citizen science. Special attention needs to be paid to transparency in community- or self-initiated projects that operate outside of organisational ethical practices. In any case, all actors must adhere to a code of research integrity and quality issues when they participate in a research project:

Data ownership and use: Citizen science is commonly perceived and placed within the open science domain, such as by complying with open data-sharing, open access publications and full transparency of data ownership. However, there may be cases in which data use is limited to certain stakeholder groups, outcomes are not made public, or publications generated are not open access, particularly with regards to privacy concerns. It is preferable for participants to own the data they generate, and they should be made fully aware of why, when and how it is used by others.

EUROPEAN CITIZEN SCIENCE ASSOCIATION
— 2020

As a result, in our study we will adopt:

SELECTION CRITERION #3
Ownership of data by citizen contributors engaged in the citizen science project

3.1.4 Higher Education involvement

This criterion is specific to the CitizenHeritage project, as it particularly tackles the place of higher education in the sustainability of citizen science projects in the cultural heritage field. This selection criterion is borrowed from a similar study on the role of higher education in citizen science (Zourou, 2020). The higher education institution can be fully or partially associated with the citizen science project.

The associated criterion is:

SELECTION CRITERION #4
Involvement of (a) higher education institution(s) in the citizen science project

3.2 Step 2: Building a pool of citizen science projects

Based on the selection criteria identified in the previous step, an inventory of citizen science practices in the cultural heritage sector was created from December 2020 to February 2021 (cf. Fig. 1). Two methodologies served to populate the inventory, a spreadsheet with descriptive data in which citizen science practices were collected by team members performing desktop research and a public survey that resulted in 41 responses from January to February 2021.

The spreadsheet, shared with CitizenHeritage project partners, compiled a documentation chart corresponding to the four criteria above with descriptive data for each listed practice and in-cell dropdown lists displaying two data validation options, “yes” and “I am not sure/I cannot judge” for responding to the four selection criteria.

The “I am not sure/I cannot judge” option was added in order to maximise data collection, allowing practices to be repeated to further analyse the matching degree between practice and criterion. We opted for a dropdown list as a provision for eliminating data errors (e.g. variety in capital letters is “machine-read” as different values) and thus, increasing data integrity and providing readily amenable data for our data visualisations and further digital scholarship. In addition, the public survey was disseminated as a Google form questionnaire, with an explicit statement that all input data will be treated in compliance with GDPR.

A final selection of 110 citizen science practices formed the inventory, by merging the eligible practices collected through desktop research and the public survey. The inventory compiles a resourceful annex of international case studies where

public participation in cultural heritage was pinpointed within a broad range of citizen science initiatives. The listed citizen science practices were analysed by carrying out descriptive statistics and data visualisations on the main selection criteria. A review of all data collected was operated against the selection criteria by the leading author and by an external reviewer. As evident in figure 2, Higher Education involvement is the most prominent criterion among the selected citizen science practices, whereas data ownership is the least.

4 selection criteria

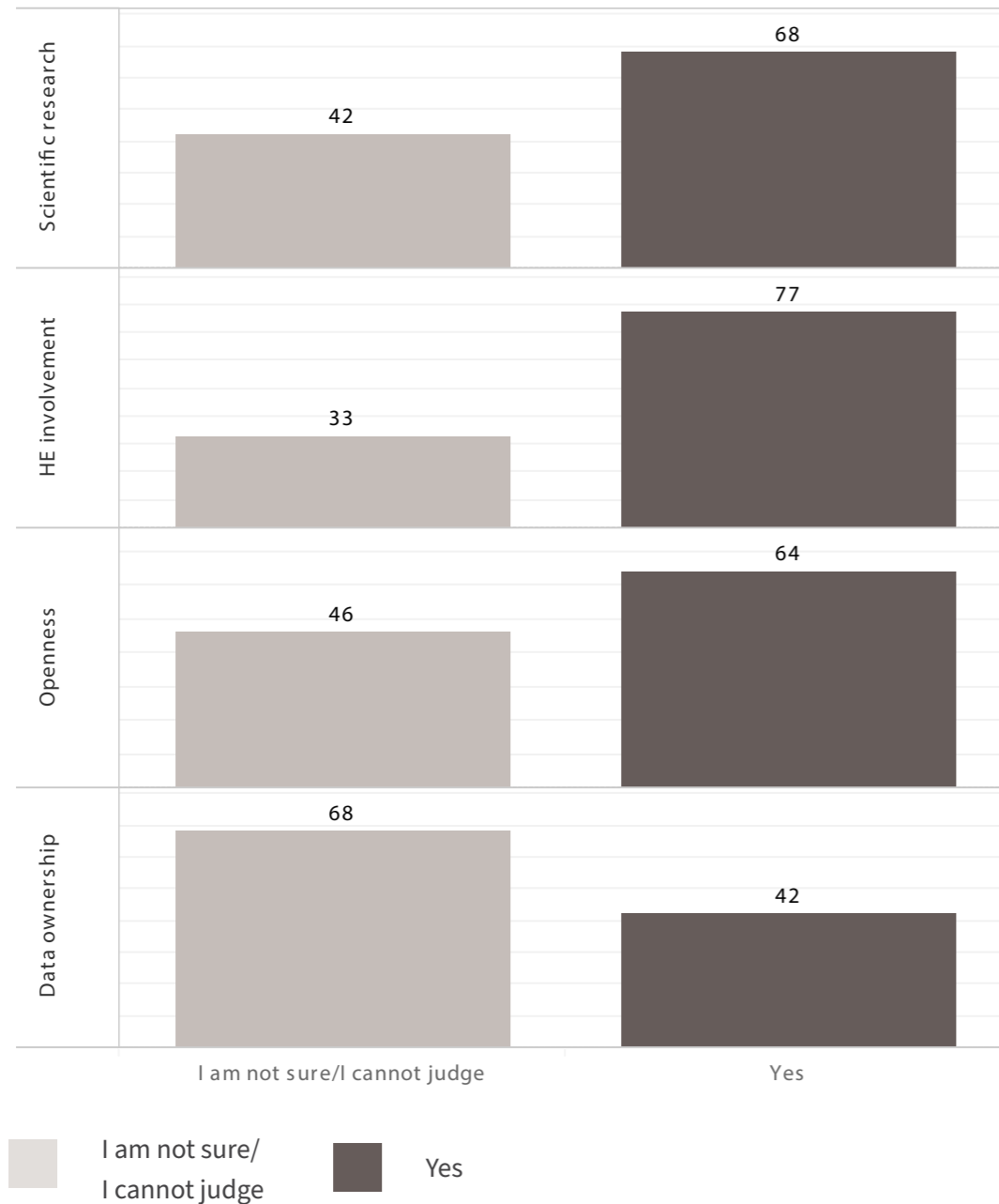


Figure 2. Diagram representing general compliance of the selected citizen science practices with the four selection criteria.

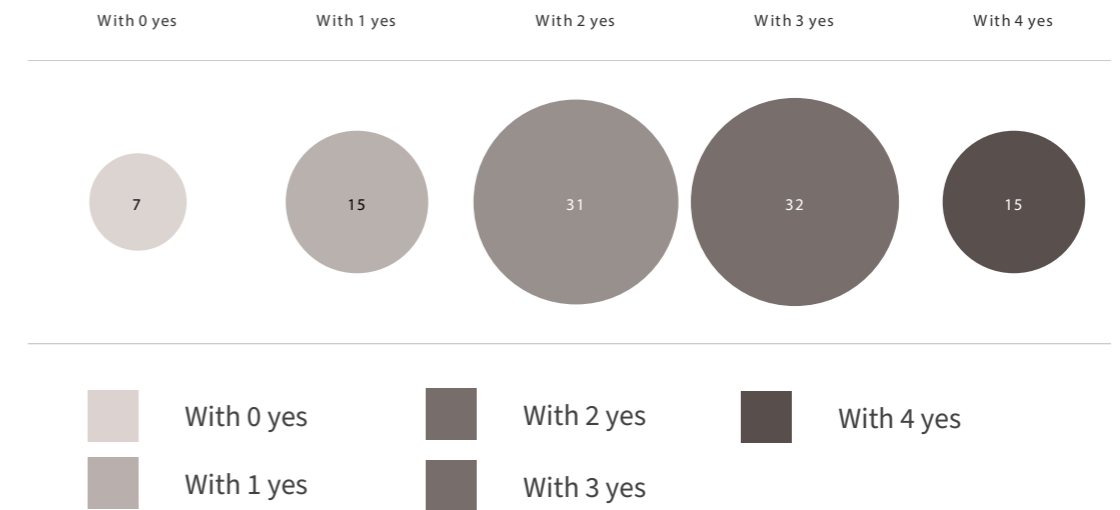


Figure 3. Data visualisation representing the degree of compliance with the four criteria of the study among the selected citizen science practices (aggregated view).

The selected citizen science practices are sorted from zero (or unknown correspondence) to fully-fledged compliance with all four criteria, as shown in figure 3, with most citizen science practices complying with 3 out of 4 criteria.

3.3 Step 3: Identification of 25 practices for further analysis projects

The inventory was filtered down to a shortlist of 25 cases, based on the statistical outcome of the listed practices against the four selection criteria. An additional criterion of geographic limitation was applied, focusing on use cases taking place in the broader European region. Supplementary factors that were taken into account for the selection of the 25 cases include:

- a) a representative geographic distribution within the broader region of Europe, and
- b) a representative number of assorted types of citizen science practices in the cultural heritage sector.

Furthermore, the identification process revealed certain grey zones of the applied typology, i.e. items with less defined classifications or limited information available. As it appeared, the type of Higher Education involvement in citizen science practices was in many cases ambiguous, while other typology items were more compound, such as the definition of the app-oriented platform under the "use of platform" typology item. However, notwithstanding the ambiguity, the study followed a practical approach to address these limitations, by including an evidence-based short explanation for each typology item.

3.4 Step 4: Analysis of the 25 use cases

DATA ANALYSIS AND VISUALISATION

Furthermore, the methodology is based on data analysis and data visualisations for distinguishing and uncovering emerging patterns on a topic, characterised as effective tools to assist in the analysis and communication of data in virtually any domain (Ward et al., 2010). Visual representations of data produced are made available as dynamic open-access data allowing further exploration and expansion. Exploratory data analysis was used to perform an initial investigation of the collected data, in order to identify trends and possible patterns facilitating its understanding through graphical representations.

The data pipeline applied here from initial data collection to rendering the visualisation, follows five simple steps: i) data compilation, ii) data modelling in a machine-readable format, iii) subset data selection or filtering, iv) parameter settings and v) visualisation rendering. In data compilation, an initial set of accumulative and quantifiable data is selected from the pool of sources and information, based on the applied typologies in the context of citizen science in cultural heritage. Next, data is modelled in machine-amenable formats, which in this case was a spreadsheet format. Structured data facilitates the generation of data visualisations, rendering data easily accessible and modifiable. In the next step, data can be further mapped and filtered, in order to control certain components of the data that can bring an enriched understanding in the end visualisation, such as assessing the data through multiple values instead of binary ones (yes/no) (e.g. not clear, weak, partly, good), in order to allow a more extensive mapping of dimensions. The next step includes parameter settings which specify attributions to the data visualisations such as, in this case, colour scheme selection, shapes and sizes. Finally, data visualisations are formed in the software interface (Tableau²⁰ has been used for this study), adjusting the mapping and including supplementary visual and information elements, such as layout, annotations and axes.

²⁰. <https://www.tableau.com/>

APPLIED TYPOLOGY

The 25 selected practices were described against a 7-item typology, to allow an in-depth understanding of each practice. The typology is partially built on a 2020 study on citizen science at universities, in the framework of the EU-funded project INOS (Zourou, 2020). More precisely, the four existing typology items used in the study include:

The 4 existing typology items used in the study include:

<p>Bonney et al. (2009) — The 3 forms of civic engagement</p> <ul style="list-style-type: none"> • Contributory • Collaborative • Co-creative 	<p>Sanz et al. (2014) — The 7 models of civic engagement in science</p> <ul style="list-style-type: none"> • Analysis tasks • Collective intelligence • Data collection • Grassroots activities • Participatory experiments • Pooling of resources • Serious games 	<p>Zourou (2020) — The 3 types of Higher Education involvement in citizen science</p> <ul style="list-style-type: none"> • Technical • Material • Human resources 	<p>Wilkinson et al. (2016) — The FAIR data guidelines for making digital assets</p> <ul style="list-style-type: none"> • Findable • Accessible • Interoperable • Reusable
--	---	--	---

The 3 new typology items that were integrated in the study include:

<p>NEW Zourou & Ziku (2022)</p> <p>— The 9-factor stack on the openness scope of citizen science practices</p> <ul style="list-style-type: none"> • Open-access • Open data • Open metadata • Open metrics • Open-source software /hardware • Open file formats • Open documentation • Open datasets 	<p>— The 4 categories of platforms used by citizen science practices</p> <ul style="list-style-type: none"> • Citizen science portal • GLAM-specific platform • Project-based platform • mobile-first platform 	<p>— The binary categorisation for software development</p> <p>(Yes/No) for indicating whether any application software has been developed as part of a citizen science project</p>
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3.4.1 Form of civic engagement in science

This dimension corresponds to the form of public participation in citizen science. The categorisation comes from a largely cited publication by Bonney et al. (2009), further developed by Haklay (2013) in regard to the levels of participation and engagement in citizen science projects. These kinds of typologies have a clear societal agenda: to encourage projects fulfilling citizen empowerment rather than exploitation, while ensuring that they contribute to science and scholarship. According to Bonney (2009), the three types of civic engagement in science are the following:

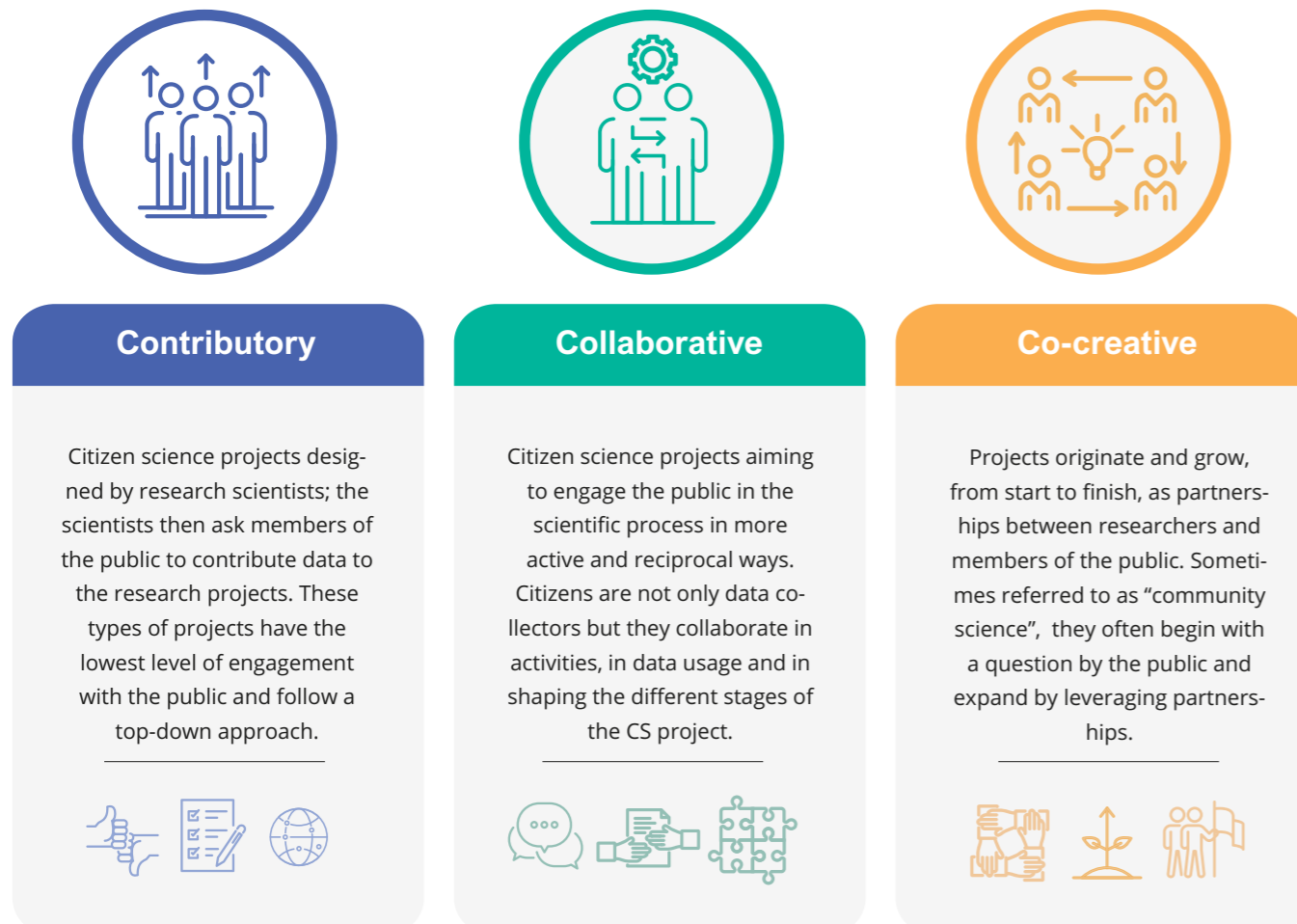


Figure 4. Three levels of civic engagement in citizen science (infographic). CC BY-ND 4.0.

3.4.2 Type of participation

The models of citizen engagement in citizen science adopted here are part of the policy recommendations for the European Commission, according to the Societize White Paper of Citizen Science (Sanz et al., 2014):

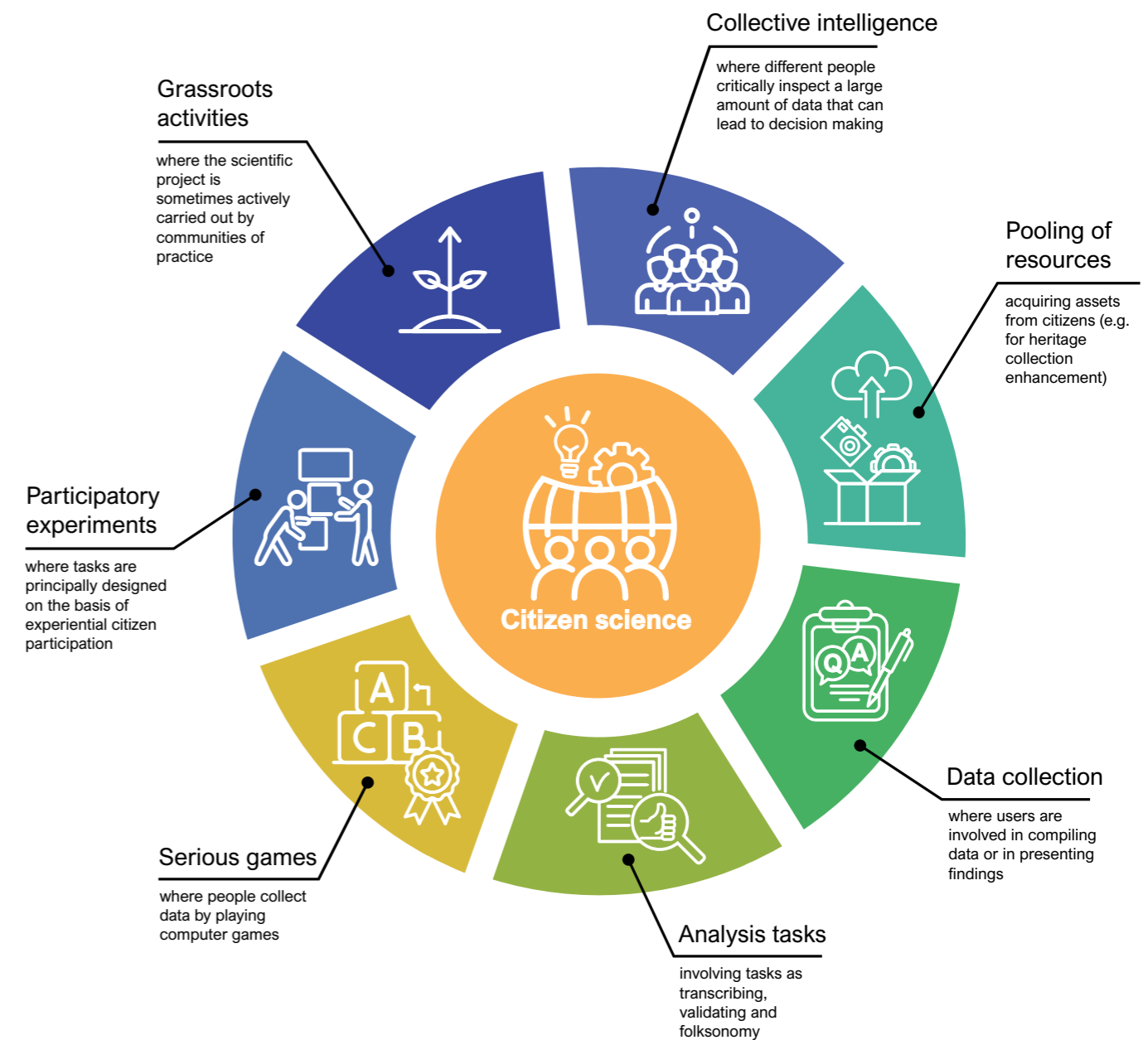


Figure 5. Type of participation in citizen science, 7-model wheel (infographic). Adapted from Sanz et al. (2014). CC BY-ND 4.0.

3.4.3 Type of Higher Education Involvement

This category corresponds to the type of involvement of a university in the suggested citizen science initiative and, in the latter case, defines the modality of its contribution:

Higher Education Involvement

Human resources

All types of human resources investment by university staff and students, not exclusively academic

Technical

Any academic expertise shared, in a theoretical or applied framework

Material

Sponsoring, hosting an event, offering grants, organising workshops etc.

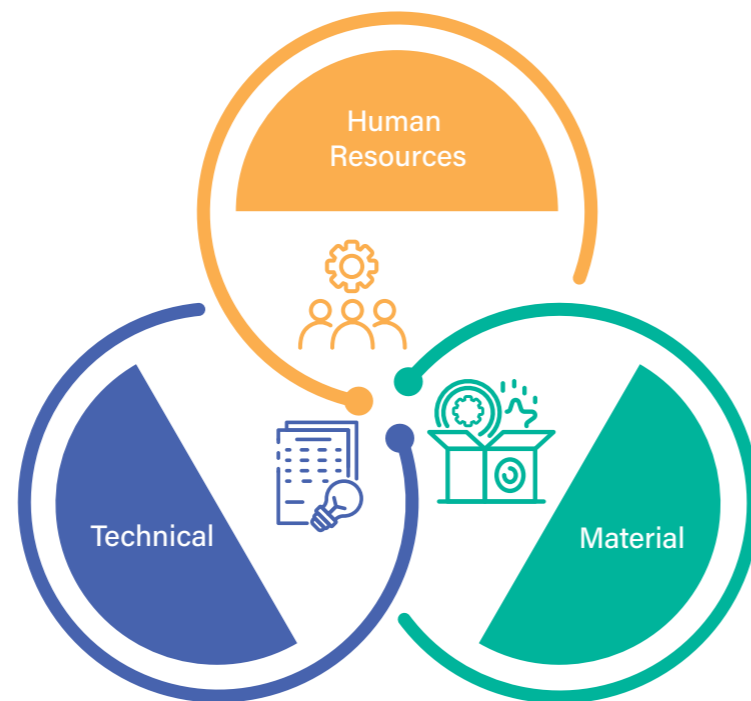


Figure 6. Three categories of Higher Education involvement for citizen science practices (infographic). CC BY-ND 4.0.

3.4.4 Use of Platform

A four-item categorisation of web infrastructures was outlined, further typifying the field of ICT-enabled project development in citizen science, thus providing an additional resource for potential data discovery:

CITIZEN SCIENCE PORTAL

Discipline-agnostic platform hosting assorted citizen science projects (e.g. Zooniverse).

GLAM-SPECIFIC PLATFORM

Hosting from one up to several citizen science campaigns specific to the cultural heritage field by hosting GLAM collections, institutions and initiatives (e.g. CrowdHeritage).

PROJECT-BASED PLATFORM

Specifically designed for a single project, extending from a simple website to a digital knowledge infrastructure (e.g. Memoria para Todos).

MOBILE-FIRST PLATFORM

An application platform that is developed primarily for mobile use (e.g. SCAPE).

3.4.5 Software application

This typology item aims to provide further insight into the digital infrastructure of the selected citizen science practices, identifying research & development components through a simple binary categorisation. The application development may encompass a variety of formats, including soft- and hardware, desktop or mobile-first applications or digital tools like algorithm-based models:

- YES/NO-NOT CLEAR

3.4.6 FAIR Data

The study further analyses the FAIR dimension of the citizen science data among the selected practices. The analysis is based on the ‘FAIR Guiding Principles for scientific data management and stewardship’ (Wilkinson, et al., 2016) which stand for the Findability, Accessibility, Interoperability, and Reuse of digital assets. In particular, the study draws on the PARTHENOS Guidelines to FAIRify data management and make data reusable in scholarly research (Hollander et al., 2018), bridging research data and infrastructures with cultural heritage institutions and related fields in the humanities and social sciences. FAIRness of the cultural heritage-related citizen science practices is measured against the 20 guidelines of PARTHENOS, which include:

FOR “FINDABLE” DATA:

- use persistent identifiers for datasets
- use persistent identifiers for authors
- cite research data
- choose a standardised metadata schema

FOR “ACCESSIBLE” DATA:

- save dataset on a trustworthy repository
- opt for open-access for data or, if not possible, for metadata
- if data cannot be accessed (data embargo) include a description of the dataset
- use standardised exchange protocols (OAI-PMH, XML, RDF)

FOR “INTEROPERABLE” DATA:

- provide machine-actionable APIs
- use well-defined vocabularies relevant to the discipline
- structure data based on interoperable standards
- enrich and clean metadata through automated processes

FOR “REUSABLE” DATA:

- document and describe data systematically (cf. gaps, method, naming conventions)
- use established, open file formats that can stand long-term
- maintain data integrity by applying version control for new versions of released data
- licence the data for reuse preferably through open licences

3.4.7 Openness scope

The pivotal role of openness in citizen science and in the scope of this study is emphasised, including a 9-factor stack categorisation in the methodology for assessing the 25 selected case studies. The definition of openness adopted here draws on the term of open science, which is approached in the interdisciplinary context of citizen science and higher education (cf. chapter 1) particularly referring to “next generations of researchers to evolve as open science citizens” (European Commission, 2017b, p. 16).

We adopt this concept in the current study by appending the field of cultural heritage in the discussion and by further analysing its scope in relation to citizen science in a 9 factor-stack typology, which includes the following criteria: open i. -access, ii. -data, iii. -metadata, iv. -metrics, v. -software, vi. -results, vii. -file formats, viii. -documentation and ix. -datasets.

The open dimension is further informed by scholarship in data governance, taking into consideration the Open Data Charter (ODC) principles in compliance with ethics in open data practices, digital asset access and use (ODC, 2015).

OPEN ACCESS

Includes applied open-access policies and statements for content sharing in cultural heritage projects that are active, and provisioning for open-access in completed projects that are archived (sustainable open access).

OPEN METRICS

Indicates access to statistics for quantitative data concerning metrics such as public engagement and outcome

OPEN FILE FORMATS

The provision for open, standardised and international file formats are suitable for long-term preservation and increase the reusability of digital assets.

OPEN DATA

Refers to the rights policy and open licences under which eligible collections and digitised or digital cultural assets are being released, whether in whole or in part.

OPEN-SOURCE SOFTWARE/HARDWARE

Refers to the rights policy and open licences under which eligible collections and digitised or digital cultural assets are being released, whether in whole or in part.

OPEN DOCUMENTATION

An openly shared systematic documentation of the project, its data and/or datasets increases transparency, trust and thus, its value within the research and professional community.

OPEN METADATA

Metadata can be shared independently from the data they are attached to, e.g. all metadata published on Europeana are open under the terms of the Creative Commons Zero Public Domain Dedication (CC0), complying de facto with the Europeana Data Exchange Agreement (DEA).

OPEN ACCESS RESULTS

The openly published results, in whole or in part, of the work created during the citizen science project

OPEN DATASETS

Datasets can be shared via data dumps, APIs for dataset download, web-based git and research repositories. Good practices include the assignment of a persistent identifier and a citation of the open dataset.

Openness scope

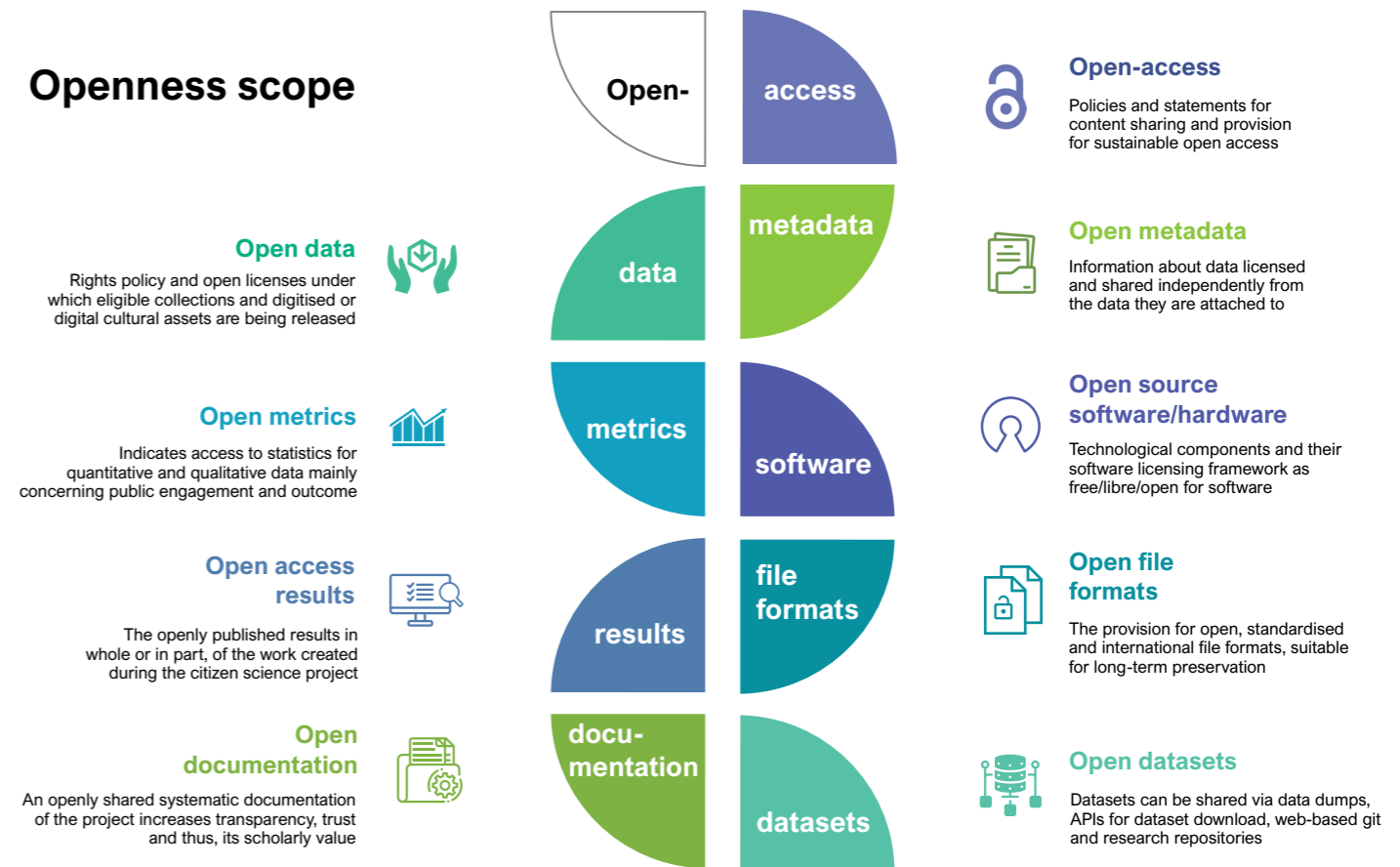


Figure 7. Openness scope in citizen science, 9-factor stack (infographic). CC BY-ND 4.0.

3.5 Limitations of the study

The study acknowledges the broader landscape of definitions and classifications related to citizen science or falling into the broader definition of participatory research and the risk of confounding bias by adhering to particular models over others.

First, the four selection criteria belong to a specific understanding of citizen science that is compatible with the overall aims of the CitizenHeritage project. Second, the categorisation of a project to the sub-categories of the 7-item typology is subjective, as it reflects the authors' interpretation of information available at desktop research stage (website and materials of each project analysed). This may be seen, positively, as an attempt to benchmark practices and to offer a cross-case comparison; however, it includes a possible misinterpretation of data. Finally, the study relies on a sample of citizen science projects identified from November 2020 to February 2021 through a public survey, with all the limitations this entails in relation to time and outreach. In view of these shortcomings, the present study can serve as a field-specific groundwork research and as an invitation to further analysis for future research.

04



Chapter 4: 25 citizen science projects

6-ITEM TYPOLOGY

The selected 25 citizen science practices were analysed in accordance with the 6 item typology, consisting of:

1. The 3 forms of civic engagement (Bonney et al., 2009)
2. The 7 models of civic engagement in science (Sanz et al., 2014)
3. The 3 types of Higher Education involvement in citizen science (Zourou, 2020)
4. The 9-factor stack on the openness scope of citizen science practices (Zourou & Ziku, 2022)
5. The 4 categories of platforms used by citizen science practices (Zourou & Ziku, 2022)
6. The binary categorisation for software development (Zourou & Ziku, 2022)

The 25 European-based citizen science practices, selected out of the pool of the 110 international cases (see chapter 3.3 about the selection process), are further analysed into a one-page short analysis for each practice, which includes a description and its categorisation based on the 6 item typology in a table format and through short texts. The different colored shapes and values of the typology categories are created in the framework of this study and are used throughout the data analysis and visualisations in chapter 5, as included in the figure legends:

- | | |
|---|--|
| <p>1. Civic engagement</p> <ul style="list-style-type: none"> + Contributory △ Collaborative ✱ Co-creative <p>3. Type of Higher Education involvement</p> <ul style="list-style-type: none"> ● Analysis tasks ■ Collective intelligence ◆ Data collection <p>4. Openness scope</p> <ul style="list-style-type: none"> good partly weak not clear <p>6. Application software</p> <ul style="list-style-type: none"> Yes/No | <p>2. Type of participation</p> <ul style="list-style-type: none"> ■ Analysis tasks ■ Collective intelligence ■ Data collection ■ Grassroots activities ■ Participatory experiments ■ Pooling of resources ■ Serious games <p>5. Use of platform</p> <ul style="list-style-type: none"> ✕ Citizen science portal ◆ GLAM-specific platform ▲ Mobile-first platform ■ Project-based platform |
|---|--|

6-ITEM TYPOLOGY

1.Civic engagement

+ **Contributory**

2.Type of participation

● **Analysis tasks**

3.University support

● **Academic**

◆ **Material**

■ **Administrative**

4.Openness scope

Open-access: **good**
 data: **good**
 metadata: **good**
 metrics: **good**
 software: **good**
 results: **partly**
 file formats: **good**
 documentation: **good**
 datasets: **not clear**

5.Use of platform

■ **Project-based platform**

6.Application software

Yes

URL:

<http://transcribe-bentham.ucl.ac.uk>

Transcribe Bentham

Short description	Case 1
<p>Transcribe Bentham is a participatory initiative at the Faculty of Laws, University College London, England, part of the Bentham Project which works for presenting the work of influential jurist, philosopher and social scientist Jeremy Bentham, as supervised by the Bentham Committee (1959-). The ongoing initiative aims to involve the public in the online transcription of the substantial body of Jeremy Bentham's manuscript material. In total 47.300 unstudied handwritten documents and amanuenses are available for transcription with 25.000 being transcribed, principally based in UCL and the British Library, including his correspondence, collected through a larger group or archival collections.</p>	

Information

1.Civic engagement	2. Type of participation	3. University support
Contributory engagement with single task to transcribe online handwritten documents following guidelines.	Analysis task which involves manuscript transcription and TEI encoding created through a button interface.	The project collaborates with UCL's Centre for Digital Humanities and other IT university services.

4. Openness scope	5. Use of platform	6. Application software
Generally good open practices, however, public transcriptions are released under CC BY-NC-ND, no clear indication for open datasets.	Manuscripts and transcripts are hosted on an open-access online repository and transcription is performed via the Transcription Desk.	Training a model to recognise Bentham's texts with Handwritten Text Recognition technology, freely available via Transkribus.

6-ITEM TYPOLOGY

1.Civic engagement

+ **Contributory**

2.Type of participation

● **Analysis tasks**

3.University support

● **Academic**

■ **Administrative**

4.Openness scope

Open-access: **good**
 data: **good**
 metadata: **good**
 metrics: **good**
 software: **good**
 results: **good**
 file formats: **good**
 documentation: **partly**
 datasets: **good**

5.Use of platform

◆ **GLAM-specific platform**

6.Application software

Yes

URL:

https://crowdsourced.micropasts.org/project/VideoTagging-RomanEmpire_2/#

MicroPasts: Video-tagging about the Roman Empire

Short description	Case 2
<p>A video tagging initiative on the platform MicroPasts, part of the digital heritage research project "Ancient Identities in Modern Britain", which is undertaken collaboratively by Durham Archaeology, Durham Anthropology and the UCL Institute of Archaeology in England, studying the ways in which ideas, people and materials connected to the Roman Empire are referenced by members of the public in relation to contemporary issues, and particularly those of mobility, borders, migrations and multiculturalism, in Britain. The project was funded by the UK Arts and Humanities Research Council for a period of three years (2016-2019).</p>	

Information

1.Civic engagement	2. Type of participation	3. University support
Contributory engagement to assist the research regarding the ways in which the Roman Empire connects to contemporary issues.	Analysis task which involves video-tagging by viewing short videos and adding tags that describe featured topics, people and periods.	Part of a 3-year collaborative digital heritage research project among the archaeology departments of UCL and Durham University.

4. Openness scope	5. Use of platform	6. Application software
Very good open practices, the app code is uploaded openly on GitHub, results are available to download in open file formats and freely usable.	Multi-GLAM platform hosting several projects, containing a forum and 50 different badges to be granted for rewarding participation.	Crowdsourcing application to tag short YouTube videos under 4 minutes that are relevant to the Roman Empire-Britain, based on PYBOSSA

6-ITEM TYPOLOGY

1.Civic engagement

+ **Contributory**

2.Type of participation

● **Pooling of resources**

3.University support

● **Academic**

4.Openness scope

Open-access: **good**
 data: **not clear**
 metadata: **not clear**
 metrics: **good**
 software: **good**
 results: **good**
 file formats: **weak**
 documentation: **good**
 datasets: **partly**

5.Use of platform

▲ **Mobile-first platform**

6.Application software

Yes

URL:

<https://sites.google.com/view/unior-nlp-research-group/resources/dodiom?authuser=0>

<http://dialectbot.appspot.com/audiomap/mappa.html#close>

Dodiom/Dialettibot: Mappa Collaborativa dei Dialetti Italiani

Short description	Case 3
<p>Dodiom and Dialettibot are systems and chatbots for learning the use of Italian idiomatic expressions and for recording and sharing Italian dialects. They have been developed by the UNIOR NLP Research Group, Department of Literary, Linguistic and Comparative Studies, University of Naples "L'Orientale", Italy. Both are based on Telegram messenger and developed as systems for scientific research on the development of linguistic models and voice-based Natural Language Processing (NLP), through data collection by people. The bots contribute to building a collective linguistic resource and an intangible heritage map; people can upload voice recordings of their own spoken dialects (220 approved recordings) and send typical proverbs or idioms of different local dialects.</p>	

Information

1.Civic engagement	2. Type of participation	3. University support
Contributory engagement for collecting Italian idiomatic expressions and voice recordings of Italian dialects.	Pooling of resources where people contribute by providing dialect voice samples, suggesting examples of idioms usage and evaluating the input of other participants.	Expertise provided on creating the application and in linguistic research, between the universities on Nijmegen and L'Orientale.

4. Openness scope	5. Use of platform	6. Application software
Good open access practices, the metrics and documentation has been shared through a scientific publication, although there are not any clear licences for content.	Both apps are developed on Telegram online messaging service. The system includes an audio web map displaying approved recordings.	Telegram based chatbots implemented in Python and hosted by the Google Application Engine.

6-ITEM TYPOLOGY

1.Civic engagement

▷ **Collaborative**

2.Type of participation

● **Pooling of resources**

3.University support

● **Academic**

◆ **Material**

■ **Administrative**

4.Openness scope

Open-access: **good**
 data: **good**
 metadata: **partly**
 metrics: **partly**
 software: **not clear**
 results: **good**
 file formats: **partly**
 documentation: **good**
 datasets: **weak**

5.Use of platform

■ **Project-based platform**

6.Application software

No

URL:

<https://memoriaparatodos.pt>

Memória para Todos

Short description	Case 4
<p>Memória para Todos (Memory for All) is a collaborative and citizen science training and research program, developed by the Faculty of Social and Human Sciences - FCSH of NOVA University of Lisbon, Portugal. It promotes the study, organization and dissemination of Portugal's historical, cultural and technological heritage, developed in close relationship with archives, institutions, municipalities, schools and local associations. The contents gathered on 13 project topics (e.g. objects, photographs, audio and video testimonies, sounds and other records) with the participation and involvement of citizens and institutions are made available online in open access.</p>	

Information

1.Civic engagement	2. Type of participation	3. University support
Collaborative engagement for preserving material and intangible heritage, raising awareness on collective memory and cultural identity construction.	Pooling of resources inviting citizens to share their personal and family memories including ephemera, actively being filmed narrating their stories.	Expertise on Oral History methodology has been applied, organising workshops on public history and collaborative practices.

4. Openness scope	5. Use of platform	6. Application software
Good open access practices, however, videos created and put on YouTube don't include licenses and the software used for Oral History digital indexing is unclear.	Project-based platform presented as webpage with embedded recorded videos of people and thorough video annotations including video time.	No application noted.

6-ITEM TYPOLOGY

1.Civic engagement

 **Contributory**

2.Type of participation

 **Analysis tasks**

3.University support

 **Academic**

 **Material**

 **Administrative**

4.Openness scope

Open-access: **good**
 data: **good**
 metadata: **good**
 metrics: **good**
 software: **good**
 results: **good**
 file formats: **not clear**
 documentation: **weak**
 datasets: **weak**

5.Use of platform

 **Citizen science portal**

6.Application software

No

URL:

<https://www.zooniverse.org/projects/courtaulddigital/world-architecture-unlocked>

World Architecture Unlocked

Short description	Case 5
<p>World Architecture Unlocked is a participatory initiative of the Courtauld Institute of Art in England, as part of the Courtauld Connects digitisation project, opening the Courtauld's Conway Library architectural image collection which contains over 1 million images with captured buildings and monuments from across the globe and throughout the ages. Once ordered, accessioned and digitised, the entire collection will be made publicly accessible online, for free. The crowdsourcing initiative started in 2020 and aims to invite people to transcribe the information in each image and add tags. So far over 65.000 images have been transcribed and 4.500 people have participated.</p>	

Information

1.Civic engagement	2. Type of participation	3. University support
Contributory engagement aiming to leverage searchability for the Courtauld image collection and opening up the collection to the world.	Analysis task includes transcribing information on images, e.g. city, name of the building, architect, date, rotation status.	The Courtauld provides technical expertise in the field, its collection and a large number of volunteers as part of its digitisation project.

4. Openness scope	5. Use of platform	6. Application software
Good open access practices, while certain unclear or weak parts such as documentation are indicated as work in progress.	Based on the Zooniverse platform, however, in the long term the transcribed metadata will help to build the future website of Courtauld's search engine.	No application noted.

6-ITEM TYPOLOGY

1.Civic engagement

 **Co-creative**

2.Type of participation

 **Grassroots activities**

3.University support

 **Academic**

 **Material**

 **Administrative**

4.Openness scope

Open-access: **good**
 data: **good**
 metadata: **good**
 metrics: **good**
 software: **partly**
 results: **good**
 file formats: **not clear**
 documentation: **good**
 datasets: **weak**

5.Use of platform

 **Mobile-first platform**

6.Application software

Yes

URL:

<http://www.ssharp.co.uk>

SHARP: Scotland's Coastal Heritage at Risk

Short description	Case 6
<p>Scotland's Coastal Heritage at Risk Project (SHARP) is developed by the SCAPE Trust, a charity and company supported by the University of St Andrews and Historic Environment Scotland, working with the public on archaeology, history and past environments of the coastal zone of Scotland. SHARP aims to increase opportunities for volunteering in the research and stewardship of Scotland's eroding coastal heritage. The first phase of the citizen and community science project ran from 2012-2016 and used innovative approaches to public involvement in the stewardship of heritage impacted by coastal processes, funded by the Heritage Lottery Fund.</p>	

Information

1.Civic engagement	2. Type of participation	3. University support
Co-creative initiative involving volunteers in archaeological and historical exploration and discovery, working together with other community projects.	Grassroots activities using an app for mapping sites at risk through GPS and a survey. The research team visits the sites and co-organises training workshops and fieldtrips.	The University of St. Adrews supports the project and the overall activities of SCAPE throughout two decades, being also part of the board of directors.

4. Openness scope	5. Use of platform	6. Application software
Very good open access practices, the application is free to use although code is not openly shared, rich in information made freely available.	The app-oriented platform collects data through filled in surveys and GPS tracking, while data are integrated into interactive web maps.	App developed for iOS and Android working with 3G connectivity, supported so far 14 ShoreDIG projects of locally-valued threatened sites.

6-ITEM TYPOLOGY

1.Civic engagement

+ **Contributory**

2.Type of participation

● **Analysis tasks**

3.University support

● **Academic**

4.Openness scope

Open-access: **good**
 data: **good**
 metadata: **good**
 metrics: **partly**
 software: **not clear**
 results: **good**
 file formats: **good**
 documentation: **good**
 datasets: **good**

5.Use of platform

■ **Project-based platform**

6.Application software

Yes

URL:

<https://fgho.eu/de/hanse-quellen-lesen>

Hanse.Quellen.Lesen!

Short description	Case 7
<p>Hanse.Quellen.Lesen! (Read.Hanse.Sources!) is a citizen science project for transcribing manuscripts from the late Hanseatic period, developed by the Research Centre for Hanse and Baltic History (FGHO) located at the European Hansemuseum, in cooperation with the Archives of the Hanseatic City of Lübeck (AHL) in Germany. In the project, Low and High German manuscripts are deciphered and translated into modern script. The results are made freely available in digital form. The project focuses on the Hanseatic history sources after 1600 that still lie in Hanseatic archives, unaccessed and unedited.</p>	

Information

1.Civic engagement	2. Type of participation	3. University support
Contributory engagement aiming at creating a basis of research for the late historic Hanseatic League period (16-17th c.) by following specific guidelines.	Analysis task, transcribing Middle Low and High German manuscripts. Participants work together on the same transcription and proofread previous ones.	The technical implementation and the creation of the "read & search" page was done by the European academic and research cooperative Read COOP.

4. Openness scope	5. Use of platform	6. Application software
Very good open access practices, the transcriptions are released under CC BY 4.0 and can be exported as TXT or XML files, although there are few metrics provided.	The project uses the Transkribus tool and is on Bürger schaffen Wissen (citizens create knowledge), a central platform for citizen science in Germany.	Training a model to recognise Hanseatic with Handwritten Text Recognition technology, using the Transkribus tool for predictive text.

6-ITEM TYPOLOGY

1.Civic engagement

+ **Contributory**

2.Type of participation

● **Collective intelligence**

3.University support

● **Academic**

◆ **Material**

■ **Administrative**

4.Openness scope

Open-access: **good**
 data: **good**
 metadata: **good**
 metrics: **good**
 software: **good**
 results: **good**
 file formats: **good**
 documentation: **good**
 datasets: **good**

5.Use of platform

✗ **Citizen science portal**

6.Application software

No

URL:

<https://livingwithmachines.ac.uk/>

Living with Machines

Short description	Case 8
<p>Living with Machines is a research project; its partnership includes the British Library, Alan Turing Institute and academic partners the Universities of Cambridge, East Anglia, Exeter, and London (QMUL), in England. The crowdsourcing and citizen history aspects are led by the Communities Lab of the British Library. Historians, data scientists, geographers, computational linguists, and curators have been brought together to examine the human impact of industrial revolution. The project is using data science to ask historical questions and find new insights from millions of pages of newspapers, maps, books and more. Funded by the UK Research and Innovation (UKRI) Strategic Priority Fund.</p>	

Information

1.Civic engagement	2. Type of participation	3. University support
Contributory engagement for generating new knowledge on the effects of how mechanisation of work changed everyday lives in the 19th c.	Collective intelligence tasks for contextual understanding, i.e. how the word "machine" was used, recording details of industrial accidents reported in 19th century newspapers.	Multidisciplinary collaboration of academic, research and GLAM institutions, supporting the cultural heritage sector in using digital methods.

4. Openness scope	5. Use of platform	6. Application software
Very good and mindful open access practices, providing downloadable open datasets in open file formats and documentation.	The project is developed on Zooniverse, with provision for improving workflows and automating classifications via user input.	Without application development, however, tools are being developed for improving computational linguistic processes.

6-ITEM TYPOLOGY




1.Civic engagement

 Collaborative

2.Type of participation

 Collective intelligence

3.University support

-  Academic
-  Material
-  Administrative

4.Openness scope

Open-access: **good**
 data: **good**
 metadata: **good**
 metrics: **not clear**
 software: **good**
 results: **good**
 file formats: **good**
 documentation: **good**
 datasets: **good**

5.Use of platform

 Project-based platform

6.Application software

Yes

URL:

<https://www.archeositarproject.it/>

ArcheoSITARproject

Short description	Case 9
<p>SITAR - Archaeological Territorial Information System of Rome - is a participatory public archaeology project promoted by the Special Superintendence of Archaeology, Fine Arts and Landscape of Rome, Italy. Its goal is to give visibility, transparency and dissemination to the scientific data of the archaeological excavations of the city of Rome: a digital portal dedicated to the heritage of Rome, freely accessible and consultable by all. The web portal makes available the ten-year experience of the project, proposed as a privileged access point to Open Data and information on the most recent discoveries about archaeological sites of the city of Rome.</p>	

Information

1.Civic engagement	2. Type of participation	3. University support
Collaborative engagement aiming at making archaeological knowledge free and accessible, adding strategic value to cultural heritage development.	the project supports collective intelligence with the possibility of customisations and changes, while working with a wealth of data within a digital infrastructure.	Collaboration for the IT development and with many academic institutions based in Italy and in Germany.


4. Openness scope	5. Use of platform	6. Application software
Very good strategy based on open science and open data (CC-BY), providing a standard for best practices, on both technical and outreach level.	Platform based on WordPress which allows users to view on a map, query and acquire data from thousands of archaeological investigations in Rome.	Two tools have been developed, the digital cartography tool WebGIS SITAR and the advanced search engine Digital Library.

6-ITEM TYPOLOGY




1.Civic engagement

 Contributory

2.Type of participation

 Pooling of resources

3.University support

-  Academic
-  Material
-  Administrative

4.Openness scope

Open-access: **good**
 data: **good**
 metadata: **good**
 metrics: **not clear**
 software: **not clear**
 results: **good**
 file formats: **good**
 documentation: **good**
 datasets: **good**

5.Use of platform

 Project-based platform

6.Application software

No

URL:

<https://led.kmi.open.ac.uk/>

Listening Experience Database

Short description	Case 10
<p>The Listening Experience Database (LED) project is a collaboration between The Open University, the Royal College of Music and (in its second phase) the University of Glasgow in England, funded by the Arts and Humanities Research Council (2012-2019). The main purpose of the project is to develop a database, freely searchable by the public, which will bring together a mass of data about people's experiences of listening to music of all kinds, in any historical period and any culture. The project includes cataloguing of personal experiences of listening to music, involving the general public by using crowdsourcing as one of the ways in which data is collected.</p>	

Information

1.Civic engagement	2. Type of participation	3. University support
Contributory engagement aiming at supporting the discovery of textual references of private listening experiences in documentary heritage collections.	Pooling of resources by inviting people to submit letters, diaries, memoirs or oral history were personal and private experiences on listening to music are provided.	Collaboration between HE institutions, developing a digital infrastructure and providing technical and human resources.

4. Openness scope	5. Use of platform	6. Application software
Very good open access practices and statement on linked open data standards, providing an RDF data dump and datasets with a CC BY-NC-SA license.	Project-based, open and freely searchable database (LED database), allowing people to contribute by filling in a detailed submission form (samples provided).	No application noted.

6-ITEM TYPOLOGY

1.Civic engagement

 **Co-creative**

2.Type of participation

 **Grassroots activities**

3.University support

 **Academic**

 **Material**

 **Administrative**

4.Openness scope

Open-access: **good**
 data: **good**
 metadata: **good**
 metrics: **weak**
 software: **good**
 results: **weak**
 file formats: **partly**
 documentation: **weak**
 datasets: **weak**

5.Use of platform

 **Project-based platform**

6.Application software

No

URL:

<https://bowb.org>

Art Pluriverse: A Community-Science Series

Short description	Case 11
<p>Art Pluriverse is a community science series for arts and culture of the Biennale of Western Balkans and the University of Ioannina (History of Art Laboratory) in Greece, working on developing community archives in order to document the cultural practices and knowledge of communities that safeguard intangible heritage practices in the Balkan region. The digital community archives are co-created together with members of the communities, researchers and Wikimedia volunteers, following a post-custodial approach that allows communities to manage their community archives based on an open-source CMS, connected to the national cultural aggregator and consecutively to Europeana, who can retrieve media and information as structured open data.</p>	

Information

1.Civic engagement	2. Type of participation	3. University support
Co-creative activities aiming to uplift intangible heritage and empower communities of practice, by documenting their knowledge in open, ethical ways.	Grassroots activities involve researchers working together with communities of practice, showing them how to use wiki-tools by following standards.	Collaboration of academic laboratories for the development of the digital infrastructure, hosting workshops and offering expertise.


4. Openness scope	5. Use of platform	6. Application software
Very good open access practices, drawing on OpenGLAM, FAIR and CARE principles, including the upload of media on Wikimedia Commons.	Project-based platform (CMS) that hosts the digital community archives. Communities have the authority to control their archives.	No application noted.

6-ITEM TYPOLOGY

1.Civic engagement

 **Contributory**

2.Type of participation

 **Serious games**

3.University support

 **Academic**

4.Openness scope

Open-access: **good**
 data: **good**
 metadata: **good**
 metrics: **weak**
 software: **not clear**
 results: **partly**
 file formats: **good**
 documentation: **partly**
 datasets: **good**

5.Use of platform

 **GLAM-specific platform**

6.Application software

Yes

URL:

<https://www.artigo.org>

ARTigo

Short description	Case 12
<p>ARTigo is a social image tagging project developed within the Ludwig Maximilian University of Munich, Germany. The project started in the early 2000s, developing online serious games with the aim to supply artworks with tags. Users can add tags to images of artworks. The image portfolio originates from the Diathek of the Institute for Art History at the University of Munich and the online database integrates photos of artworks whose the copyright holders (author and illustrator/photographer) have been dead for at least 70 years. The project is funded by the German Research Foundation (DFG).</p>	

Information

1.Civic engagement	2. Type of participation	3. University support
Contributory engagement aiming at advancing searchability of works of art through data enrichment.	Users can view works of art and describe the artworks accurately through tags by playing various serious games, competing with co-players and gaining points.	Collaboration between the LMU Institutes of Art History and Informatics, under the LMU Center for Digital Humanities which developed the serious games.

4. Openness scope	5. Use of platform	6. Application software
Good open access practices providing a clean database dump via Open Data LMU and a CC BY-NC-SA 4.0 data license, however, the software is not openly shared.	GLAM-specific platform aimed to be used by museums; includes a RESTful API, with an explicit data protection declaration based on GDPR.	8 games have been developed, based on Luis von Ahn's concept of ESP Game, involving a collaborative system for gaining points among players.

6-ITEM TYPOLOGY

1.Civic engagement

 **Contributory**

2.Type of participation

 **Analysis tasks**

3.University support

 **Academic**

4.Openness scope

Open-access: **good**
 data: **partly**
 metadata: **not clear**
 metrics: **good**
 software: **not clear**
 results: **good**
 file formats: **good**
 documentation: **partly**
 datasets: **partly**

5.Use of platform

 **GLAM-specific platform**

6.Application software

No

URL:

<https://www.duchas.ie/en/info/meitheal>

Meitheal Dúchas.ie: Community Transcription

Short description	Case 13
<p>Meitheal Dúchas.ie is a community transcription initiative, part of the project Duchas which is a digital humanities project of the National Folklore Collection at the University College Dublin (UCD), for archiving and digitising Ireland's oral tradition. The initiative invites the users to transcribe the stories that were collected as part of the Schools' Collection, which contains 740,000 pages of folklore and local tradition, compiled from 1937 to 1939 by over 50,000 schoolchildren from 5,000 schools in the Irish Free State. Pupils were enlisted to collect folklore in their home districts. This included oral history, topographical information, folktales and legends, riddles and proverbs, games and pastimes, trades and crafts. The children have recorded this material from their parents', grandparents' and neighbours' reports.</p>	

Information

1.Civic engagement	2. Type of participation	3. University support
Contributory engagement aiming at advancing the National Folklore Collection and awareness of Irish tradition.	Transcription of handwritten texts, in English and Irish, from the Schools' Collection. The editorial team reviews new members' input before publication.	The online collection and transcription is developed by the UCD in collaboration with the Fiontar & Scoil na Gaeilge, Dublin City University.

4. Openness scope	5. Use of platform	6. Application software
Open access practices include a surname index downloadable in XML format under an Open Database License (ODbL) v1.0. and transcription material is under a CC BY-NC 4.0 licence.	Single-GLAM platform, displaying the 500 more recent transcriptions organised in several tags e.g. "anonymous contributor", "senior member".	No application noted.

6-ITEM TYPOLOGY

1.Civic engagement

 **Co-creative**

2.Type of participation

 **Data collection**

3.University support

 **Academic**

 **Material**

4.Openness scope

Open-access: **good**
 data: **good**
 metadata: **good**
 metrics: **weak**
 software: **partly**
 results: **good**
 file formats: **partly**
 documentation: **good**
 datasets: **weak**

5.Use of platform

 **GLAM-specific platform**

6.Application software

No

URL:

<https://fifties.withculture.eu/home/project>

Fifties in Europe Kaleidoscope

Short description	Case 14
<p>The project aims at leveraging photographic content in Europeana depicting the 1950s in Europe, developed by a consortium of 10 European institutions led by the Katholieke Universiteit Leuven and the Photoconsortium. Kaleidoscope wants to connect today's citizens with the post-war generation whose dreams of a better life led to the establishment of the European Union. The project was co-funded by the European Union in the frame of the Connecting Europe Facility Program (CEF), starting in 2018 and lasting for 18 months. Approximately 8.000 annotations were collected via the WITHcrowd tool and added to Europeana collections.</p>	

Information

1.Civic engagement	2. Type of participation	3. University support
Co-creative, increasing engagement with Europeana content, by heightening user interaction through crowdsourcing and co-curation.	The public can participate in enriching descriptive data of image collections as well as in workshops on photographic images as mnemonic devices.	National Technical University of Athens (NTUA) has built the participatory platform for hosting the annotation campaigns.

4. Openness scope	5. Use of platform	6. Application software
Good open access practices and open data. Metadata (i.e. image tags) added by the public are integrated into Europeana under a CC0 license.	WITHcrowd multi-GLAM platform supports annotation campaigns and lets users to accumulate points. The top 3 get a badge (gold, silver, bronze) and a reward.	No application noted.

6-ITEM TYPOLOGY



1. Civic engagement

 Co-creative

2. Type of participation

 Participatory experiments

3. University support

 Material
 Administrative

4. Openness scope

Open-access: **partly**
data: **partly**
metadata: **weak**
metrics: **partly**
software: **not clear**
results: **good**
file formats: **not clear**
documentation: **good**
datasets: **weak**

5. Use of platform

 Project based platform

6. Application software

No

URL:

<https://www.photoconsortium.net/europeforculture/>

WeAre#EuropeForCulture

Short description

Case 15

WeAre#EuropeForCulture is a project for celebrating the diversity of European cultural heritage, organising a series of pop-up exhibitions in ten European countries from 2019 to 2020, funded by the European Commission in the framework of the European Year of Cultural Heritage 2018. The project follows a series of co-creation sessions where target users are invited to add their bit of family heritage and history to the bigger picture of the exhibition theme. The pop-up events offer a novel way of enjoying cultural heritage and help to discover nice stories digging in family albums and non-institutional heritage. Collaborations were established with CHIS, schools, universities, seniors and the final event was hosted at the House of European History in Brussels.


Information

1. Civic engagement	2. Type of participation	3. University support
Co-creative engagement reinforcing a sense of belonging to a common European environment and building a sense of community.	Participatory experiments that invite the public to add their family heritage and history in the exhibition theme, bringing personal items to display and helping with curation.	KU Leuven managed the project and coordinated content and exhibition. The technical component was developed by a non-academic partner.

4. Openness scope	5. Use of platform	6. Application software
The project includes a documentation of the co-creation exhibition sessions in the form of text and photos, however, indication for license is unclear.	Project-based platform hosting the documentation for each exhibition, including videos, photos and descriptive texts, in the form of webpages.	No application noted.

6-ITEM TYPOLOGY



1. Civic engagement

 Collaborative

2. Type of participation

 Data collection

3. University support

 Academic
 Administrative

4. Openness scope

Open-access: **good**
data: **good**
metadata: **good**
metrics: **not clear**
software: **good**
results: **not clear**
file formats: **good**
documentation: **not clear**
datasets: **not clear**

5. Use of platform

 Mobile-first platform

6. Application software

Yes

URL:

<https://seco.cs.aalto.fi/projects/sualt>

FindSampo SuALT

Short description

Case 16

The Finnish Archaeological Finds Recording Linked Open Database (SuALT) is a multidisciplinary project developing innovative solutions to respond to metal detecting and other non-professional encounters with archaeological material, applying semantic computing to "citizen science". The methods and Open Source tools developed are also applicable to other cultural heritage citizen science fields. The key product of the project is a demonstrator, FindSampo (Fi. Löytösampo), a semantic portal and Linked Open Data service based on the "Sampo" model and a member of the Sampo series of systems for Digital Humanities research and application. The research is funded by the Academy of Finland.

Information

1. Civic engagement	2. Type of participation	3. University support
The project aims to provide open and easy to use report and analysis tools to be used for documenting archaeological findings.	Collaborative approaches for hobby metal detecting communities, aiming to advance the discovery reporting process and its potential.	The project is developed by the Semantic Computing Research Group (SeCo), located at Aalto University and University of Helsinki (HELDIG).

4. Openness scope	5. Use of platform	6. Application software
The project is developed based on the principles of archaeological Linked Open Data and in order to provide open access tools for wide use.	FindSampo is a web portal under development. A prototype of a citizen science platform following a mobile-first and user-centred design has been developed.	Application designed as part of a master thesis within the project, including evaluation and user experience surveys.

6-ITEM TYPOLOGY

1.Civic engagement

+ **Contributory**

2.Type of participation

● **Collective intelligence**

3.University support

● **Academic**

■ **Administrative**

4.Openness scope

Open-access: **good**
 data: **partly**
 metadata: **not clear**
 metrics: **good**
 software: **good**
 results: **good**
 file formats: **not clear**
 documentation: **good**
 datasets: **weak**

5.Use of platform

✕ **Citizen science portal**

6.Application software

No

URL:

<https://www.zooniverse.org/projects/evakap/heritage-quest>

Heritage Quest

Short description	Case 17
<p>Heritage Quest (Erfgoed gezocht) is a citizen science project in which volunteers help archaeologists in the quest for undiscovered archaeological heritage. The aim is to find archaeological remains hidden under dense vegetation cover, by utilising LiDAR data (Light Detection And Ranging), which is a 3-dimensional point cloud that allows the investigation of areas that are obscured by forest cover. The participation of citizen scientists makes it possible to study much larger areas and attain a more representative sample than would be possible by professional archaeologists alone. Involving the public allows the collection of big data. In addition, the volunteer-discovered data will contribute to machine learning and automated detection.</p>	

Information

1.Civic engagement	2. Type of participation	3. University support
Contributory engagement aiming at advancing the search for archaeological heritage in the Netherlands through public archaeology.	Small map pieces are shown to participants in order to mark all traces of burial mounds, Celtic fields and cart tracks, attaining a reliable sample based on the "wisdom of the crowd".	The project is led by the Universiteit Leiden, specialising in many fields, including digital archeology and citizen science.

4. Openness scope	5. Use of platform	6. Application software
Open access practices include open metrics and software facilitated by the platform and open results shared in the form of a newsletter with infographics.	The project is developed on Zooniverse, including a guide provided for recognising the features to be classified and a discussion board.	No application noted.

6-ITEM TYPOLOGY

1.Civic engagement

+ **Contributory**

2.Type of participation

● **Data collection**

3.University support

● **Academic**

◆ **Material**

■ **Administrative**

4.Openness scope

Open-access: **good**
 data: **good**
 metadata: **partly**
 metrics: **weak**
 software: **good**
 results: **weak**
 file formats: **not clear**
 documentation: **weak**
 datasets: **not clear**

5.Use of platform

◆ **GLAM-specific platform**

6.Application software

Yes

URL:

<https://sealinmedia.wordpress.com>

Accurator

Short description	Case 18
<p>Accurator is a research outreach tool for enriching museum collections with domain-specific scientific knowledge, aiming to identify the niche of relevant experts and motivate them to contribute to the annotation of artworks. It is a crowdsourcing framework developed in the context of the SEALINCMedia project in the Rijksmuseum, allowing users to contribute their expert knowledge to cultural heritage collections, based on the concept of "nichesourcing". This could, for example, be the annotation of the depicted species of an animal or a plant. Apart from enhancing the descriptions of the collection items, this information can be used to facilitate searching the museum's collection.</p>	

Information

1.Civic engagement	2. Type of participation	3. University support
Contributory engagement that aims to identify the niche of relevant experts, motivating them to contribute to the annotation of artworks.	Data collection targeted to experts of a domain (niche) and not the general public. Experts are shown items that correspond to their expertise and provide annotations.	The SEALINCMedia project is a part of the COMMIT project, which brings together academic and (non-)profit organizations to solve challenges in ICT.

4. Openness scope	5. Use of platform	6. Application software
Open access practices include open content, open software archived on GitHub, however, there is few information on documentation, metadata or metrics.	The project included the development of prototype platforms such as the DigiBird infrastructure, so as to integrate crowdsourcing results from domain-specific collections.	The application is no longer in active development and has been archived on GitHub. It ran on top of the Cliopatria triple store extension (SWI-Prolog).

6-ITEM TYPOLOGY

1.Civic engagement

 **Contributory**

2.Type of participation

 **Analysis tasks**

3.University support

 **Academic**

4.Openness scope

Open-access: **good**
 data: **partly**
 metadata: **good**
 metrics: **partly**
 software: **not clear**
 results: **good**
 file formats: **not clear**
 documentation: **not clear**
 datasets: **not clear**

5.Use of platform

 **GLAM-specific platform**

6.Application software

No

URL:

<https://photoconsortium.net/pagode>

PAGODE

Short description	Case 19
<p>PAGODE is an innovative project co-financed by the European Union under the CEF Connecting Europe Facility Programme that will contribute to generating a rich user experience and high audience engagement with Europeana, the European digital library. PAGODE also supports Cultural Heritage Institutions by proposing a holistic approach in the aggregation, curation and presentation of Chinese cultural heritage preserved in Europe. PAGODE aggregates to Europeana a minimum of 10,000 new objects, annotates and enriches more than 20,000 digital objects already in Europeana, activating Cultural Heritage Institutions to plan new digitisation and enrichment of digital cultural heritage items.</p>	

Information

1.Civic engagement	2. Type of participation	3. University support
Contributory engagement aiming at bringing more Chinese collections into Europeana in participatory ways through annotations and interlinking.	Users can add, upvote or downvote tags by other users, recognising places, historic periods, pictorial styles or other photo qualities i.e. contrast, landscape, portrait.	The Department of Asian Studies at the University of Ljubljana offers academic expertise on the cultures and language of Asia (especially East Asia).

4. Openness scope	5. Use of platform	6. Application software
The project is in development. Metadata and metrics are open as part of the CrowdHeritage platform and the Europeana metadata provision (CC0).	CrowdHeritage Multi-GLAM platform hosted the PAGODE campaign for participatory annotations, including a badge reward for most active users.	No application noted.

6-ITEM TYPOLOGY

1.Civic engagement

 **Collaborative**

2.Type of participation

 **Participatory experiments**

3.University support

 **Academic**

 **Material**

 **Administrative**

4.Openness scope

Open-access: **good**
 data: **partly**
 metadata: **not clear**
 metrics: **partly**
 software: **not clear**
 results: **partly**
 file formats: **not clear**
 documentation: **good**
 datasets: **not clear**

5.Use of platform

 **Project-based platform**

6.Application software

No

URL:

<https://www.reach-culture.eu/project>

REACH

Short description	Case 20
<p>The REACH project, proposed to map, evaluate, analyse, model and report on participatory approaches and research, offers concrete participatory experiences in cultural heritage through pilots. REACH was funded by the European Union's Horizon 2020 research and innovation programme. The REACH social platform offers tools to trigger the debate on how participatory approaches can contribute to developing a common horizon of understanding European cultural heritage, including various workshops, meetings and events. Participatory approaches are expected to contribute to a deeper engagement of civil society in the research and establishment of innovation processes in the CH sector.</p>	

Information

1.Civic engagement	2. Type of participation	3. University support
Collaborative engagement focusing on participatory approaches to the preservation, (re-)use, and management of CH.	Participatory experiments taking place within site-specific and theme-oriented pilots, including minority, rural and small towns' heritage.	Project coordination by Coventry University, data collection work package by Universidad de Granada and participatory pilots by Univerzita Karlova.


4. Openness scope	5. Use of platform	6. Application software
Open documentation and open-access information on best practices and pilot results, however licensing statements and metrics are not clear.	Project-based platform includes a "Good Practices Database" with 128 best practices listed that can be filtered by Keywords, CH Category, CH Themes and Country.	No application noted.

6-ITEM TYPOLOGY

1.Civic engagement

 **Contributory**

2.Type of participation

 **Pooling of resources**

3.University support

 **Administrative**

4.Openness scope

Open-access: **good**
 data: **good**
 metadata: **partly**
 metrics: **good**
 software: **good**
 results: **weak**
 file formats: **not clear**
 documentation: **weak**
 datasets: **weak**

5.Use of platform

 **Project-based platform**

6.Application software

Yes

URL:

<https://ajapaik.ee/>

Ajapaik

Short description	Case 21
<p>Ajapaik is a crowdsourcing platform aiming at enriching pictorial heritage with additional metadata, mostly hosting historic photographs from Estonia and Finland. The project has been in progress since 2011 by the Estonian Photographic Heritage Society. It is connected to Wikimedia Commons, Finna, Europeana, and other repositories in order to retrieve content. Ajapaik is a non-profit venture of the Estonian Photographic Heritage Society (MTÜ Eesti Fotopärand) that was created during a Garage48 hackathon in February 2011. Over 125,000 pictures have been added to the map by more than 10,000 users. The platform is mostly hosting old photos, but there are also paintings, graphic art and historic films on Ajapaik.</p>	

Information

1.Civic engagement	2. Type of participation	3. University support
Contributory engagement for the enrichment on data for historic imagery mostly from Estonia and mainly from public collections.	Users can use tools for geotagging pictures, tagging persons, transcribing notes on pictures or rephotographing historic pictures to create then-and-now picture pairs.	Involvement of HE institutions has been mainly on individual level, contributing as human resources on various stages of the project.

4. Openness scope	5. Use of platform	6. Application software
Open access practices that are in continuous progress, including good metrics that are automatically updated and code openly shared on GitHub.	Project-based platform that uses open-sourced Django project code and includes a harvester for harvesting records from multiple infosystems.	Android rephotography app with internationalisation and localisation on Translatewiki. Next steps include the integration with Wikimedia Commons.

6-ITEM TYPOLOGY

1.Civic engagement

 **Contributory**

2.Type of participation

 **Analysis tasks**

3.University support

 **Administrative**

4.Openness scope

Open-access: **good**
 data: **partly**
 metadata: **good**
 metrics: **good**
 software: **weak**
 results: **good**
 file formats: **not clear**
 documentation: **weak**
 datasets: **weak**

5.Use of platform

 **GLAM-specific platform**

6.Application software

No

URL:

<https://crowdheritage.eu/en/garment-classification>

CrowdHeritage: Fashion Garment's Type

Short description	Case 22
<p>The "Fashion Garment's Type" is a crowdsourcing campaign for adding and validating the object type of historical fashion garments, curated by the European Fashion Heritage Association on the open platform CrowdHeritage. The platform aims to allow everyone to participate in the enrichment of digital cultural heritage content stored in many cultural institutions across Europe. Its scope is to use the knowledge of the crowd in order to improve the metadata quality of digital cultural heritage content stored in Europeana, the European portal for cultural heritage, and in the databases of several cultural heritage institutions across Europe.</p>	

Information

1.Civic engagement	2. Type of participation	3. University support
Contributory engagement for the digital transformation of fashion heritage, advancing EFHA's digital repository of fashion heritage online.	Analysis tasks where users are able to add annotations or validate existing ones for fashion items, in a user-friendly and engaging way.	The crowdsourcing platform has been developed by the National Technical University of Athens. Individuals have been taking part from various HEIs as transcription users.

4. Openness scope	5. Use of platform	6. Application software
Good open access practices provided by the platform, including open metrics and open metadata, however, an open documentation of the initiative is missing.	CrowdHeritage Multi-GLAM platform uses gamification elements (badge reward) and verifiable results for developing the user's experience through participative annotations.	No application noted.

6-ITEM TYPOLOGY

1.Civic engagement

 Co-creative

2.Type of participation

 Grassroots activities

3.University support

 Academic

 Material

 Administrative

4.Openness scope

Open-access: **good**
 data: **good**
 metadata: **good**
 metrics: **not clear**
 software: **good**
 results: **good**
 file formats: **good**
 documentation: **partly**
 datasets: **not clear**

5.Use of platform

 Project-based platform

6.Application software

No

URL:

<https://www.c2dh.uni.lu/projects/public-history-new-citizen-science-past-phacs>

PHACS: Participatory Urban Project

Short description	Case 23
<p>PHACS (Public History as the New Citizen Science of the Past) is a historical research project that develops public history and participatory models for interpreting the past, funded by a 5-year ATTRACT research grant (2020-2025) from the Luxembourgish National Research Fund (FNR). The programme develops citizen science initiatives, including a collaboration with the town of Esch-sur-Alzette (Luxembourg), offering a framework for local communities to collect, select, and interpret 100 objects that will be the basis of a co-created exhibition and a co-curated digital map of hidden popular sites in town. Inspired by the development of digital participatory practices (citizen sciences, crowd/community sourcing), PHACS facilitates interactions between academics, cultural institutions, groups, artists, associations, and the general public.</p>	

Information

1.Civic engagement	2. Type of participation	3. University support
Co-creative engagement that contributes to the democratisation of historic access and production of history.	Grassroots activities for co-constructing historical imaginary, involving various communities from Luxembourg in collaborative enactments.	The project is conducted by the interdisciplinary Luxembourg Centre for Contemporary and Digital History (C ² DH) at the University of Luxembourg.

4. Openness scope	5. Use of platform	6. Application software
The project is in progress and the openness scope is in development.	Project-based platform is in progress.	No application noted.

6-ITEM TYPOLOGY

1.Civic engagement

 Co-creative

2.Type of participation

 Pooling of resources

3.University support

 Academic

 Administrative

4.Openness scope

Open-access: **good**
 data: **partly**
 metadata: **partly**
 metrics: **partly**
 software: **not clear**
 results: **not clear**
 file formats: **partly**
 documentation: **partly**
 datasets: **weak**

5.Use of platform

 Project-based platform

6.Application software

No

URL:

<https://www.topothek.at/en/>

Topotheque

Short description	Case 24
<p>Topotheque is a platform with an online archive that operates in local settings. The project creates a network of regional historical sources of reference, focusing on preserving historical material kept in private hands and making it visible to the public. The main aim of the Topotheque is to make the historical heritage of Europe digitally available via the Internet. The topotheques which got set up during the project's lifetime (2014-2018) are visible beyond the funding period. Topotheque contributes to building regional and historic identities of communities and their population. It is part of the European Citizen Science Association and a project of the International Centre for Archival Research.</p>	

Information

1.Civic engagement	2. Type of participation	3. University support
Co-creative engagement that fosters a community of local archives for the protection and accessibility of local history.	Pooling of resources includes photos of individuals and communities like associations or businesses, who can provide material for the documentation of their history.	HE institutions' involvement seems to be on a more broad cooperative context, contributing mainly through technical or human resources.

4. Openness scope	5. Use of platform	6. Application software
The project is open access and provides a solution for making material that is considered "orphaned" freely accessible to the world, through crowdsourcing.	Project-based platform hosting the topotheques, keeping them visible beyond the funding period and the project's lifetime (2014-2018).	No application noted.

6-ITEM TYPOLOGY

1.Civic engagement

+ **Contributory**

2.Type of participation

● **Analysis tasks**

3.University support

● **Academic**

4.Openness scope

Open-access: **good**
 data: **good**
 metadata: **good**
 metrics: **good**
 software: **good**
 results: **good**
 file formats: **not clear**
 documentation: **partly**
 datasets: **partly**

5.Use of platform

◆ **GLAM-specific platform**

6.Application software

No

URL:

<https://europeana.transcribathon.eu/runs/europeana1914-1918>

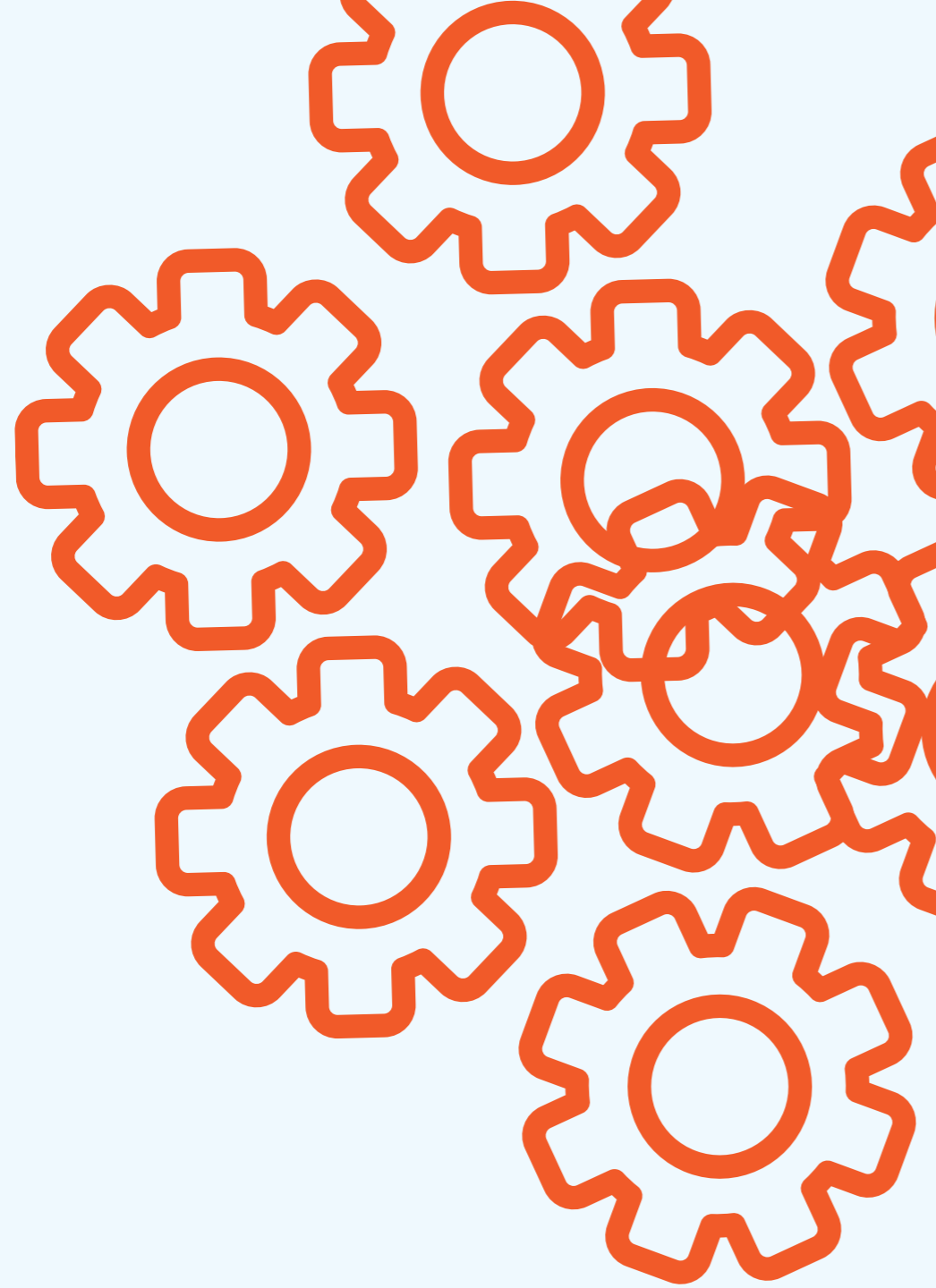
Transcribathon: Europeana 1914-1918

Short description	Case 25
<p>Europeana 1914-1918 is a multinational and multilingual online run of the Enrich Europeana project, an online crowdsourcing platform for the enrichment of European digital cultural heritage. The aim is to create a vast and fully digital record of the stories in the Europeana 1914-1918 collection, including collections of untold stories and the official history of World War I, in a blend of cultural heritage collections and personal items contributed by European citizens. The Transcribathon project was a Europeana Generic Services project and it was co-financed by the Connecting Europe Facility of the European Union.</p>	

Information

1.Civic engagement	2. Type of participation	3. University support
Contributory engagement aiming at involving the public in transcribing and annotating Europeana's collection of digitised items.	Analysis tasks where citizens are asked to transcribe, geo-tag and annotate historical documents and photos.	Involvement of the Austrian Institute of Technology for the platform development by providing technical resources.

4. Openness scope	5. Use of platform	6. Application software
Good open access practices including open metadata and providing platform components under a free software license (GPL V.2), openly shared via GitHub.	Multi-GLAM platform developed within the Enrich Europeana project, enabling transcriptions and annotations for a wide variety of Europeana's digital heritage collections.	No application noted.



Chapter 5: Synthesis of findings

5.1 Forms of citizen engagement in science

ANALYSIS

The selected 25 citizen science practices were categorised in accordance with the three model typology of Bonney et al. (2009) for civic engagement in citizen science (cf. 3.4), consisting of the items: “contributory”, “collaborative” and “co-creative”. In figure 8, data is presented in a listed, case by case view, revealing the overall density of civic engagement forms, as ascribed to each practice.

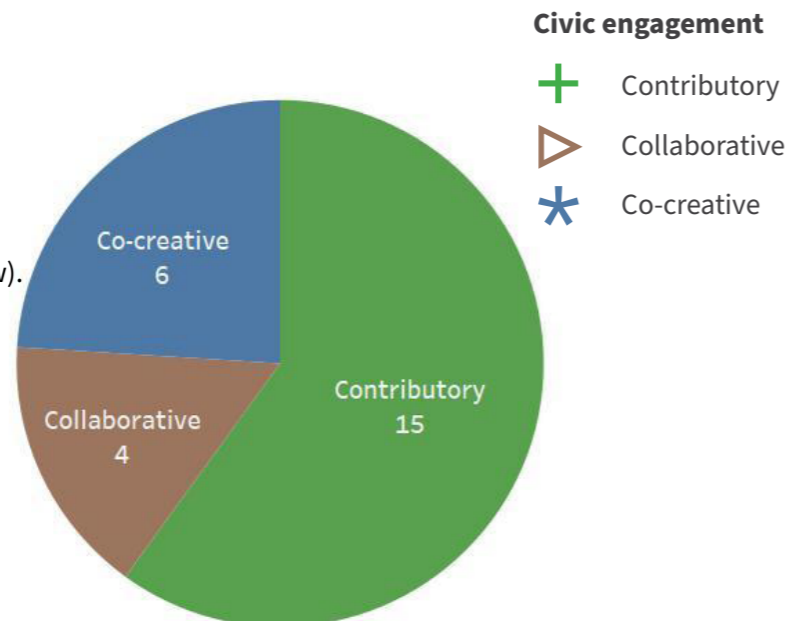
The 25 selected citizen science practices are further analysed, with insights into their distribution per typology item. The analysis is supported by data representations that visualise the categorisation of the 25 practices based on the seven-item typology in two ways, by listing each individual practice as categorical data under their respective typology categories and by providing an aggregated view of the data per typology in numerical sums. Additionally, the typology item “civic engagement” is represented through geographical data distribution, locating each practice in the respective country where each is being developed. The indicative coloured shapes in the graphs represent the various items of the typology and correspond to those used in the previous section (ch. 4). Finally, a synthesis of findings is presented which includes an analysis of combined data, relating different typology items and bringing new insights.

Civic Engagement

Citizen science practices	Civic engagement		
	Contributory	Collaborative	Co-creative
Accurator	+		
Ajapaik	+		
ArcheoSITAR Project		▷	
Art Pluriverse: A Community Science Series			*
ARTigo	+		
CrowdHeritage: Fashion Garment's Type	+		
Dodiom	+		
Fifties in Europe Kaleidoscope			*
Hanse, quellen, lesen!	+		
Heritage Quest	+		
Listening Experience Database	+		
Living with Machines	+		
Meitheal Dúchas.ie: Community Transcription	+		
Memória para Todos		▷	
Micro-Pasts: Video-tagging about the Roman Empire	+		
PAGODE	+		
PHACS: Participatory Urban Projects			*
REACH		▷	
SCAPE: Scotland's Coastal Heritage at Risk			*
SuALT: Finnish Archaeological Finds		▷	
Topotheque			*
Transcribathon: Europeana 1914-1918	+		
Transcribe Bentham	+		
WeAre#EuropeForCulture			*
World Architecture Unlocked	+		

Figure 8. Civic engagement model (index view).

Figure 9. Civic engagement model (aggregated view).



Civic engagement

- Contributory
- Collaborative
- Co-creative

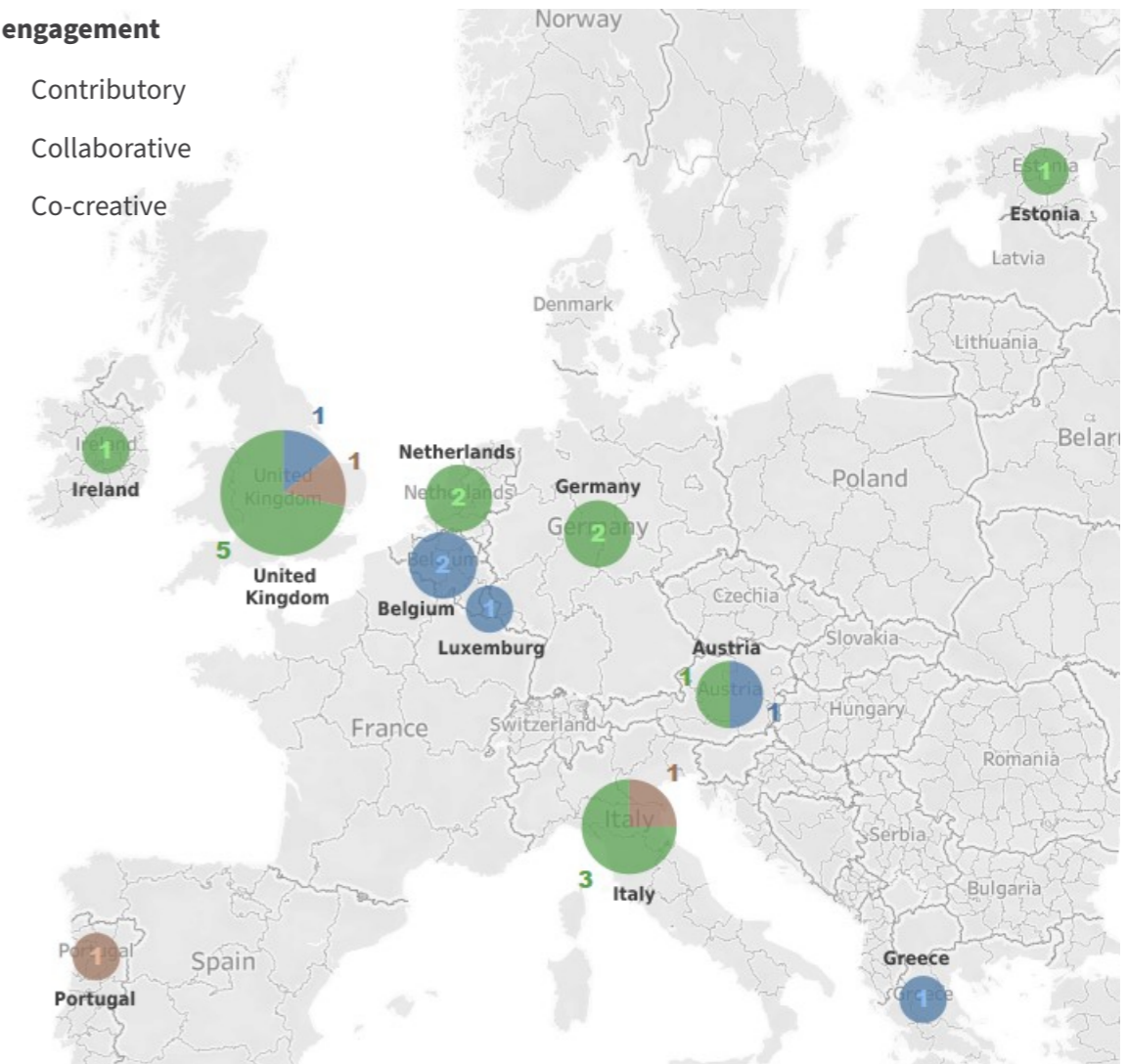


Figure 10. Geographical distribution of practices per country, based on the civic engagement model.

As demonstrated in the graphs, most practices adopt a contributory approach, which may reflect a low level of interaction with public participants. Collaborative and co-creative approaches are developed considerably fewer times, which corresponds to study findings that point to the mainly institutional-driven nature of citizen science projects (Strasser et al., 2019).

The geographical scope of the three civic engagement forms is shown in figure 10. A few citizen science practices stem from a consortium with partners from different places, in which case the country of the project leader is marked as the representative country.

5.2 Type of participation

This categorisation follows the seven “models of citizen science engagement in science”, as presented in the Societize White paper of Citizen Science (Sanz et al., 2014), which includes analysis tasks, collective intelligence, data collection, grassroots activities, participatory experiments, pooling of resources and serious games. Few initiatives (Heritage Quest, REACH) include activities that may be fitting to more than one type of participation, however, the selected practices have been ascribed only to one category. Figure 11 provides a listed view of the participation types that reveal the density of each category per column and the ascribed category for each case by row.



Figure 11. Type of participation (index view).

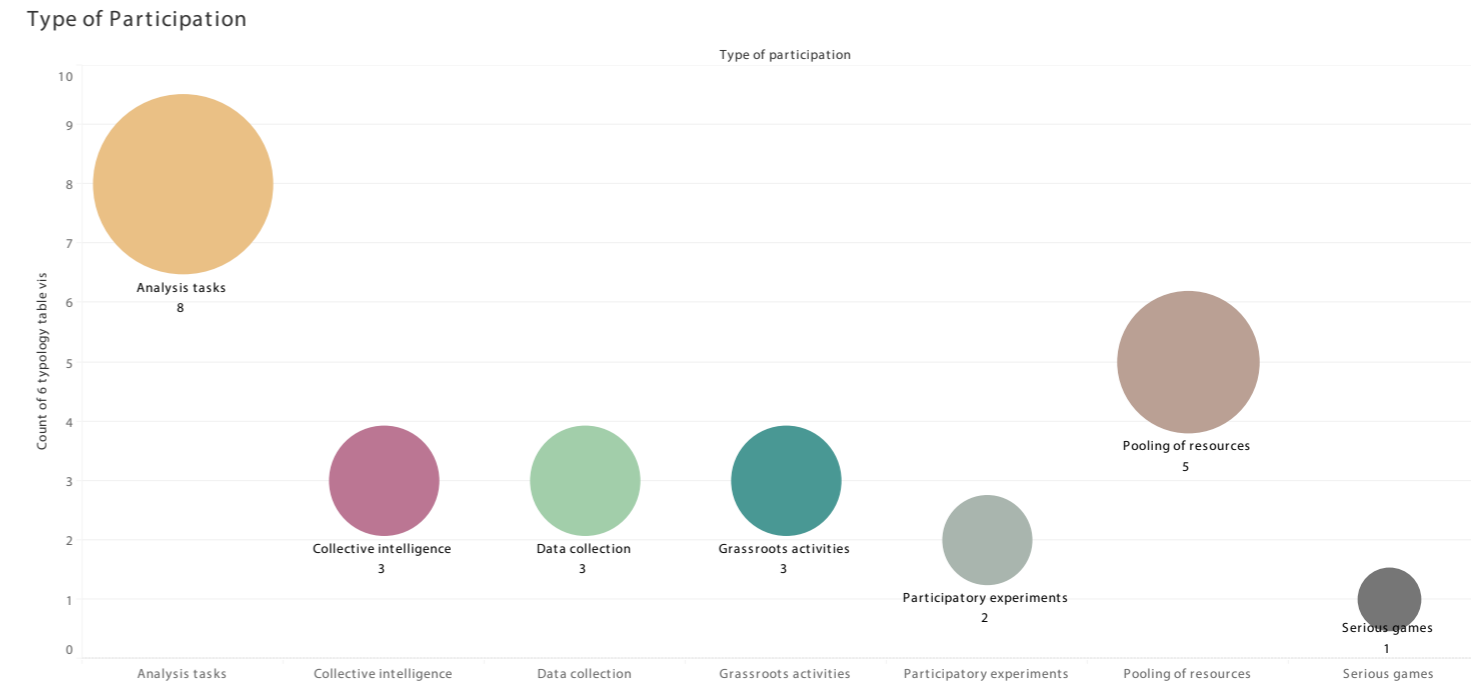
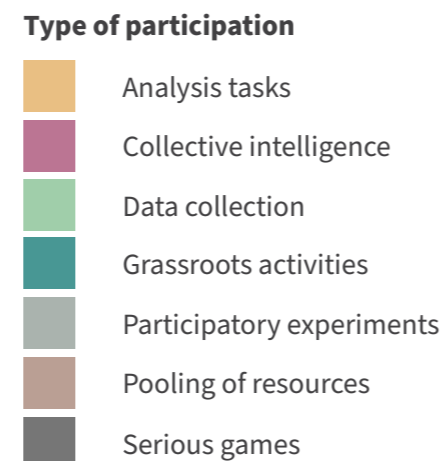


Figure 12. Type of participation (aggregated view).

The least populated participation type classes are serious games and participatory experiments, which usually involve a specialised application development for the former and the design of more interactive and creative participatory activities for the latter. The most populated classes concern analysis tasks and pooling of resources, which cover a contributory type of civic engagement, reflecting also the prevalence of the contributory category among citizen science projects, (as evidenced in the analysis under section 5.1 of the study). Three cases have been ascribed respectively to each of the types of collective intelligence, data collection and grassroots activities.

5.3 Type of Higher Education involvement

The analysis shows that the 25 practices have at least one type of connection to Higher Education since this was one of the main criteria for their selection out of the 110 practices. The selected practices under this typology can be ascribed to more than one category, while almost half of the practices correspond to all three categories.



Figure 13. Type of Higher Education involvement (index view).

An overview of all 25 practices is provided in figure 13, regarding the combinations of Higher Education involvement types among the citizen science practices. The three rows represent the typology items, appearing in descending order from the most occurring type, which is technical involvement (top row - blue dot), to human resources (middle row - orange square) and to the least occurring type which is material provision (bottom row - brown diamond).

Type of Higher Education involvement

- Analysis tasks
- Collective intelligence
- ◆ Data collection

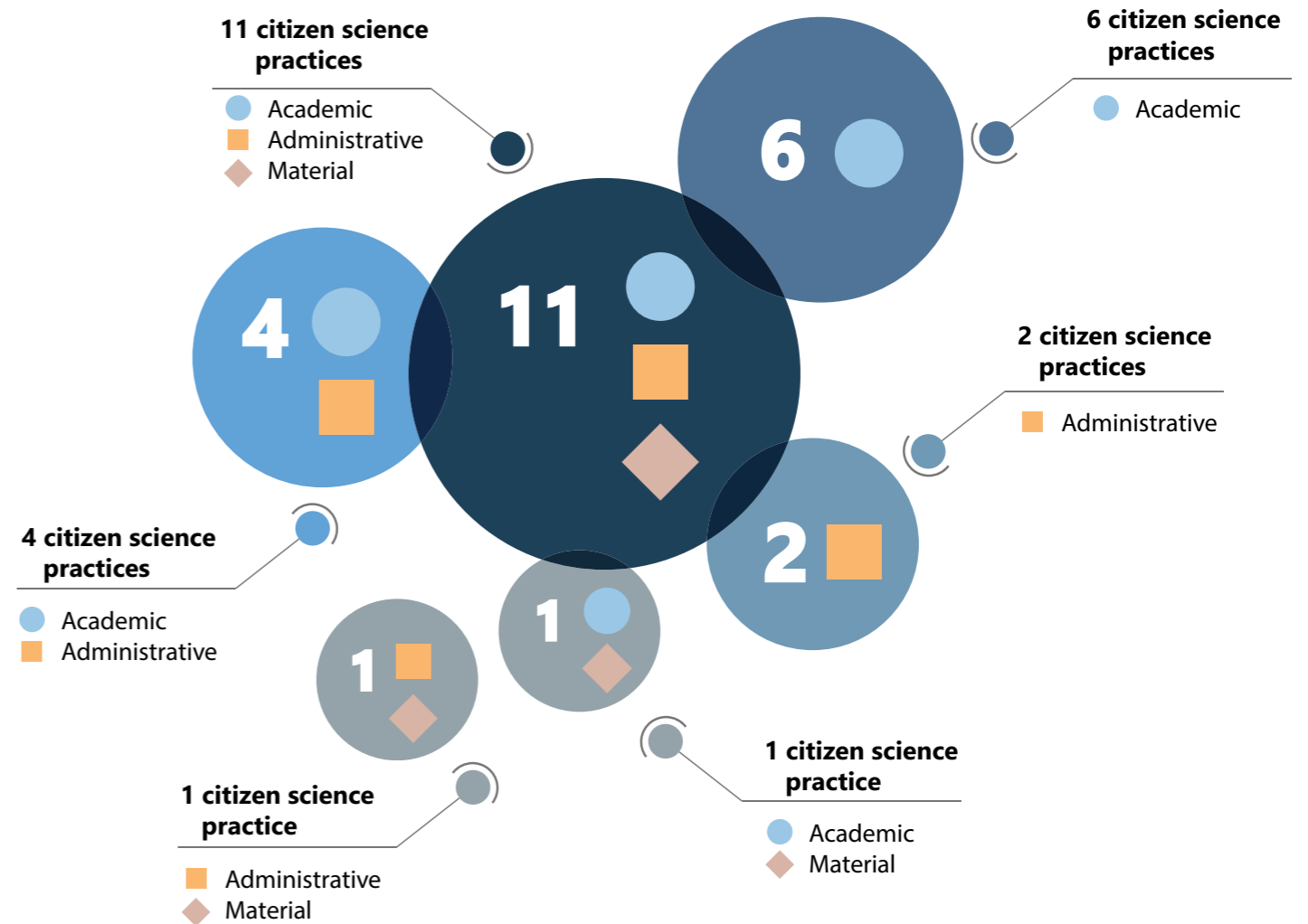


Figure 14. Type of Higher Education involvement, aggregated view of combined typology items.

Figure 14 brings an aggregated view of the combination of types in Higher Education involvement, as found among the selected citizen science practices. All three types (material, human resources, technical) are present in most cases (11 cases), showing that Higher Education Institutions are usually taking place with full support in citizen science projects. If universities participate under one type, it is usually by providing technical support (as evident in 6 cases), whereas providing only human resources is rare and providing only material support did not occur in our data. If two out of three types of involvement are present, it is usually the combination of human resources and technical support, whereas the other two possible combinations (material/technical and material/human resources) occurred only once each.

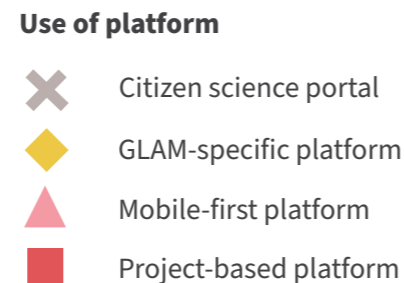
5.4 Use of platform

“Use of platform” refers to the technical infrastructure where every citizen science initiative is operating or showcased. Each practice is ascribed to one, out of three, broadly defined categories of platform use: citizen science portal, GLAM-specific platform, project-based platform and mobile-first platform. The objective of this typology is to provide an indicative overview of the platform morphology for hosting citizen science projects in cultural heritage. Furthermore, it outlines options for designing and publishing citizen science projects from an infrastructure



Figure 15. Use of platform (index view).

“Citizen science portal” refers to a web infrastructure that can host several citizen science campaigns by various institutions stemming from a broad spectrum of disciplines. Three case studies, selected under the “citizen science portal” category, utilise Zooniverse and its project builder workflow, which is currently the largest portal for designing and hosting citizen science projects.



A “GLAM-specific platform” may host from one up to many citizen science or crowdsourcing campaigns, pointing to a web infrastructure that is specific for GLAMs and/or heritage collections. The CrowdHeritage platform was used by three out of eight case studies ascribed under this category (Pagode, the Fifties in Europe Kaleidoscope and CrowdHeritage Fashion Garment’s Type) and is open for use to GLAMs that may share their collections’ metadata for fix or enrichment. A GLAM-specific platform can also be bound to one GLAM institution or initiative and is usually used to enrich its heritage collections, as is the case of the Meitheal Dúchas transcription platform, part of the digitisation project for the National Folklore Collection (Ireland) housed in University College Dublin.

A “project based platform” is deployed by the majority of practices, which may span from a simple WordPress website to a web infrastructure with customised modules. Project-based platforms may be part of a citizen science project operated by a consortium of partners (cf. REACH, Memória para Todos) or as an initiative by a higher education institution or other initiative that has developed its own platform (cf. ARTigo, ArcheoSITAR project).

Finally, the “mobile-first platform” refers to citizen science projects that principally use a downloadable mobile application with a user interface for data input and display, rather than a desktop platform. It is interesting to note that among the three case studies under this category, the source code has not been publicly shared and is not specified as open-source. Apart from the three case studies ascribed to the mobile-first platform category, other practices may include the development of software applications; however, these are mainly applications for desktop use and/or have mostly complementary use.



Figure 16. Use of platform (aggregated view).

5.5 Application software

With a simple with/without categorisation, this typology offers an overview of projects that have developed application software for advancing their mission.

CS practices	App Development	
	with	without
Accurator	●	
Ajapaik	●	
ArcheoSITAR Project	●	
Art Pluriverse: A Community Science Series		○
ARTigo	●	
CrowdHeritage: Fashion Garment's Type		○
Dodiom	●	
Fifties in Europe Kaleidoscope		○
Hanse, quellen, lesen!	●	
Heritage Quest		○
Listening Experience Database		○
Living with Machines		○
Meitheal Dúchas.ie: Community Transcription		○
Memória para Todos		○
Micro-Pasts: Video-tagging about the Roman Empire	●	
PAGODE		○
PHACS: Participatory Urban Projects		○
REACH		○
SCAPE: Scotland's Coastal Heritage at Risk	●	
SuALT: Finnish Archaeological Finds	●	
Topotheque		○
Transcribathon: Europeana 1914-1918		○
Transcribe Bentham	●	
WeAre#EuropeForCulture		○
World Architecture Unlocked		○

Figure 17. Overview of application software development.

As demonstrated in figure 17, a significant number of citizen science practices have developed a type of application that supports their projects. In the case of Ajapaik, a mobile application for rephotography has been developed for matching images “now” and “then”, while other projects have embarked in the development of machine learning algorithms for ameliorating transcription processes (as in Transcribe Bentham and Hanse, quellen, lesen).

5.6 FAIR Data

We further assess the 25 citizen science practices against the FAIR dimension, analysing the four items of the FAIR typology (findability, accessibility, interoperability and reusability) in a two-value notation, “yes” and “not clear”. The data analysis methodology is based on the PARTHENOS guidelines which analyse the FAIR data principles in the form of twenty recommendations. Each citizen science practice was assessed against the guidelines and was marked as positive (yes) if at least one of the guidelines for each FAIR dimension was met, or as “not clear” if no relevant information was found.

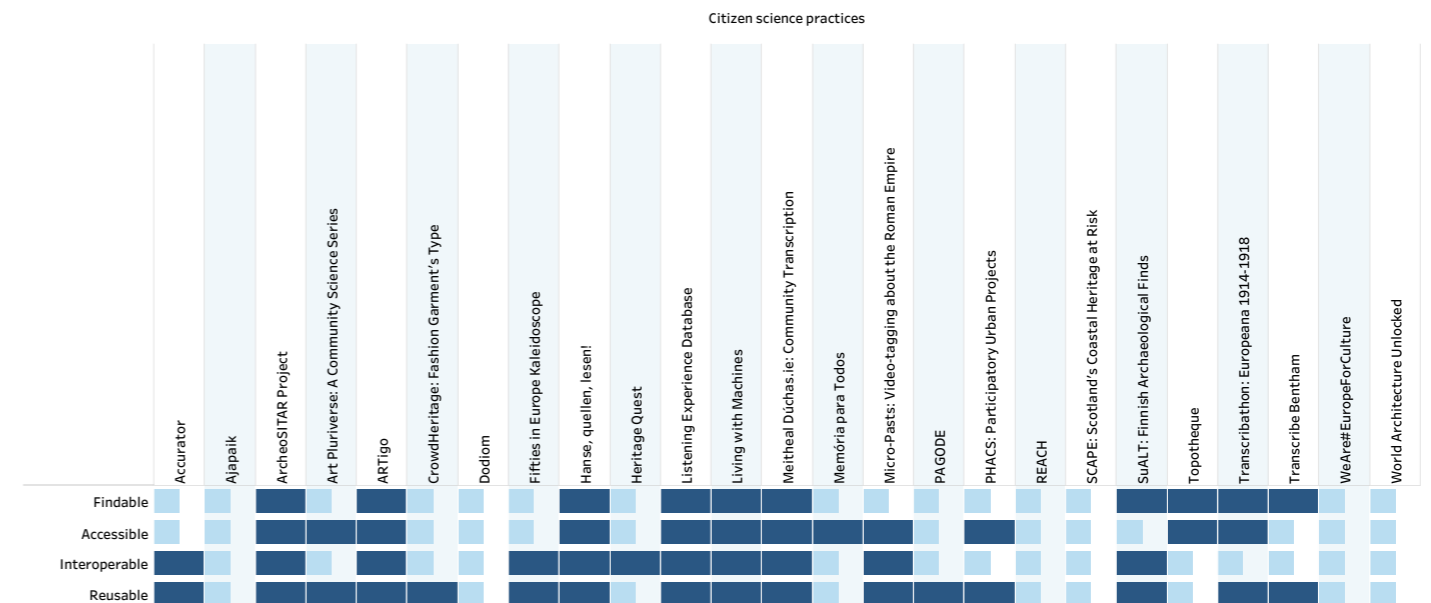


Figure 18. Assessment of the FAIR dimension taking two values (“yes” - dark blue bar or “not clear” - light blue bar).

As shown in figure 18, reusability is the most deployed typology item with 16 citizen science practices following at least one of the respected PARTHENOS guidelines in this category. This usually includes the transparent communication of data and metadata reuse through widely adopted licences such as Creative Commons. Many citizen science projects use an open licence (cf. CC BY, CC BY-SA, CC0, Public Domain); for instance all projects with heritage collections connected to Europeana, have to upload their metadata by default under CC0, even if their data is under a closed licence (PAGODE, CrowdHeritage, Fifties in Europe Kaleidoscope). The Transcribathon platform communicates a Public Domain licence in the “terms of use” page for the transcribed material by citizens, whereas Transcribe Bentham includes a closed licence (CC BY-NC-ND 4.0). However, both cases communicate the reusability of their (meta)data, even if the latter does so in a more restrictive manner, thus both have been marked as positive.

Interoperable citizen science data seem to be present in 11 out of the 25 practices. According to the PARTHENOS guidelines, this may include the provision for a machine-actionable API (ARTigo, the Fifties in Europe Kaleidoscope on the WITHcrowd platform). The usage of established and well-defined vocabularies enhance interoperability and was applied, among others, by Hanse, quellen, lesen!, Meitheal Dúchas.ie and the ArcheoSITAR Project. At least one case, the ARTigo project, enhances data quality and interoperability by providing a cleaned version of the derived citizen science data.

Well-defined access conditions for citizen science data are based on the usage of standardised communication protocols and on clear statements of accessibility. 12 cases provide accessible citizen science data, by publishing conversions of metadata into standardised schemas as XML and/or TXT (cf. Meitheal Dúchas.ie, Hanse, quellen, lesen!, Transcribe Bentham). Clear statements of accessibility are provided through the main project platform, as well as through supportive documents and infrastructures, as in the case of the “SCAPE: Scotland's Coastal Heritage at Risk” project, which provides downloadable PDFs with rich open-access information. Accessibility is also connected with the use of a trusted repository for making the data available. In this case, using established infrastructures that can be provided by universities (e.g. university libraries) or GLAM institutions

and documentation centres, is a good practice for enhancing the accessibility of citizen science data in the long-term, as in the “Listening Experience Database” project which uses robust database infrastructures provided by the Open University (knowledge graphs, datasets, interlinked open institutional repositories).

Finally, findability seems to be the least deployed typology item, with only 10 cases applying at least one of the PARTHENOS guidelines. While findability can be enhanced through relatively easy steps, i.e. by providing an indicative citation of the data, using a persistent identifier (as a DOI) for the dataset and using a standardised metadata schema for capturing information were not applied by the majority of cases. For example, many practices state that their citizen science data is open-access and published under an open licence. However, without a persistent identifier, data is usually lost with new website updates and changes to URLs. In addition, by providing a way to cite the data based on discipline-specific standards, they can be found more easily. In this vein, the “Living with Machines” project provides a DOI, while the projects Hanse, quellen, lesen!, Meitheal Dúchas.ie and Transcribe Bentham provide citations for the data.

5.7 Openness scope

Openness in citizen science and in the scope of the study plays a pivotal role. Therefore we specified a 9-factor stack categorisation to render this dimension more specific. Although certain categories may display similarities (cf. metrics, results, documentation), we opted for a refined categorisation of openness which could prompt a better understanding of open enhanced citizen science and the implementation of openness in a more accessible and step-wise approach. In this respect, “open access results” refer to published project outcomes, whereas “open documentation” refers to a detailed description of the project’s stages. “Open metrics” can be part of the results or documentation, however, when highlighted as a separate criterion, it can explicitly manifest the presence of measurable data which might otherwise not be clearly presented in the results or in the documentation. Metrics can include, among others, real-time insights, other quantitative or qualitative data records and various visualisations and data representations.

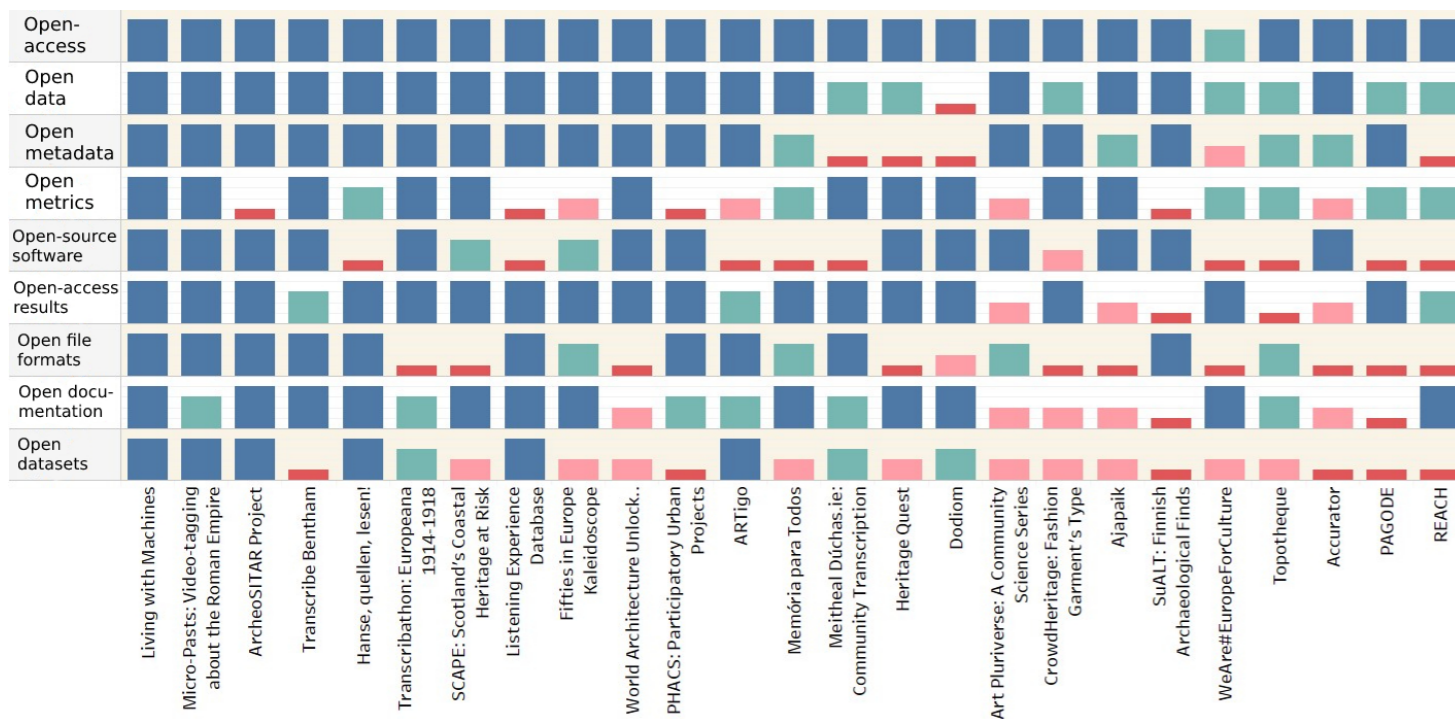


Figure 19. Assessment against the 9-factor openness scope taking four values (“not clear” and “weak” (red and pink), “partly” and “good” (green and blue)).

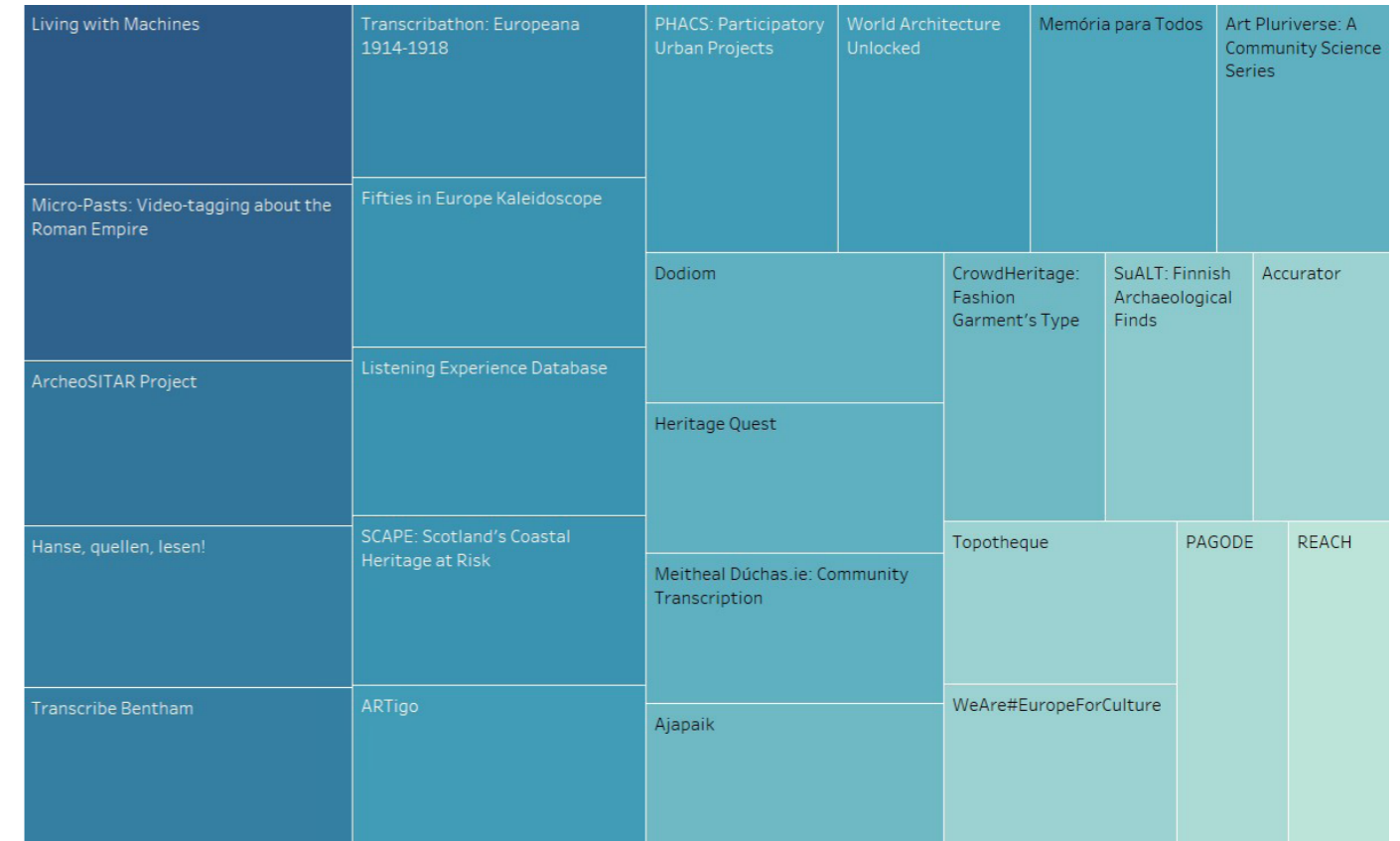


Figure 20. Treemap view of the 25 selected citizen science practices, sorted according to the 9-factor openness comparator; top left (dark blue) indicates higher openness compliance, whereas bottom right (bright green) indicates practices in a development phase or with less information about their openness scope.

An overview of the practices against the nine openness criteria in a data representation format shows the prevailing categories where a good openness scope was achieved by the majority of practices (cf. open- access, data, metadata and results); whereas an overall weak openness scope is pinpointed in the categories of open-source, soft- and hardware, metrics and datasets which encompass more technology-related and data-driven indicators.

Featured pointers

- ▶ This paragraph briefly discusses practical ways to implement the openness criteria in the context of citizen science, drawing on the selected 25 case studies. Open access can be communicated through an open access policy statement and a clear summary of the open factors that have been applied in each case. Open access can further include an ethics statement in the form of a code of conduct or ethics addressing open principles and other supporting values. In addition, provision for a data protection and privacy compliance statement (GDPR) when needed, can also be part of an open-access policy, as evident in the ARTigo project.
- ▶ Open datasets can include a machine-readable downloadable version of the data/metadata, preferably a “cleaned” version, providing a ready-to-use dataset for digital scholarship (e.g. for computational data analysis and representation). This way researchers’ work can be facilitated and encouraged by further examining the project by digital means. Towards this direction, the Living with Machines project by the British Library has permanently archived, in its research repository, the user-generated data of the project, as datasets available to be downloaded and reused through an open-access public domain licence.
- ▶ Moreover, open documentation could include, apart from the description of the project’s stages, a technical documentation with graph representations of the platform’s architecture, application and/or the data model, providing a more comprehensive view. The ArcheoSITAR project provides such a graph of the digital platform, in addition to a lay description of the various modules, apps and systems comprising the platform.
- ▶ Open-source software could be made openly available through git repository platforms such as GitHub that may also be open to peer contributions, open integration of new code, versioning as well as open-access archiving when the software is rendered inactive. The Accurator is such a case of an inactive project, which has been archived and maintained in a publicly accessible repository on GitHub.

5.8 Synthesis

The combination of the seven-dimensional typology is presented in this section. Figure 21 with data analysis of the combined categories “type of participation” and “civic engagement” reveals a strong correlation between at least two pairs of corresponding category items.

Citizen science practices	Analysis tasks	Collective intelligence	Data collection	Grassroots activities	Participatory experiments	Pooling of resources	Serious games
Accurator			+				
Ajapaik						+	
ArcheoSITAR project		▷					
Art Pluriverse: A Community Science Series				*			
ARTigo							+
CrowdHeritage: Fashion Garment’s Type	+						
Dodiom						+	
Fifties in Europe Kaleidoscope			*				
Hanse, quellen, lesen!	+						
Heritage Quest		+					
Listening Experience Database						+	
Living with Machines		+					
Meitheal Dúchas.ie: Community Transcription	+						
Memória para Todos						▷	
Micro-Pasts: Video-tagging about the Roman Empire	+						
PAGODE	+						
PHACS: Participatory Urban Projects				*			
REACH					▷		
SCAPE: Scotland’s Coastal Heritage at Risk				*			
SuALT: Finnish Archaeological Finds			▷				
Topotheque						*	
Transcribathon: Europeana 1914-1918	+						
Transcribe Bentham	+						
WeAre#EuropeForCulture					*		
World Architecture Unlocked	+						

Figure 21.

Combined view of the two typology items “civic engagement” (shape) and “type of participation” (colour) (index view).

Type of participation

- Analysis tasks
- Collective intelligence
- Data collection
- Grassroots activities
- Participatory experiments
- Pooling of resources
- Serious games

Civic engagement

- Contributory
- Collaborative
- Co-creative

The first pair is “analysis tasks” as a type of participation and “contributory” as a civic engagement form. Based on the study, all eight cases categorised as analysis tasks have a contributory form of civic engagement. This may point to a design pattern for developing citizen science projects: analysis tasks, which usually involve transcribing, validating or collaborative tagging activities, can be primarily combined with a contributory form of civic engagement.

The second pair is “grassroots activities” (type of participation) and “co-creative” (civic engagement), where all three cases involving grassroots activities have implemented a co-creative approach for civic engagement. Other typology items, such as collaborative forms of civic engagement and types of participation, are distributed in the context of the study in less correlating terms. However, typology correlations might change with a larger dataset or a different selection.

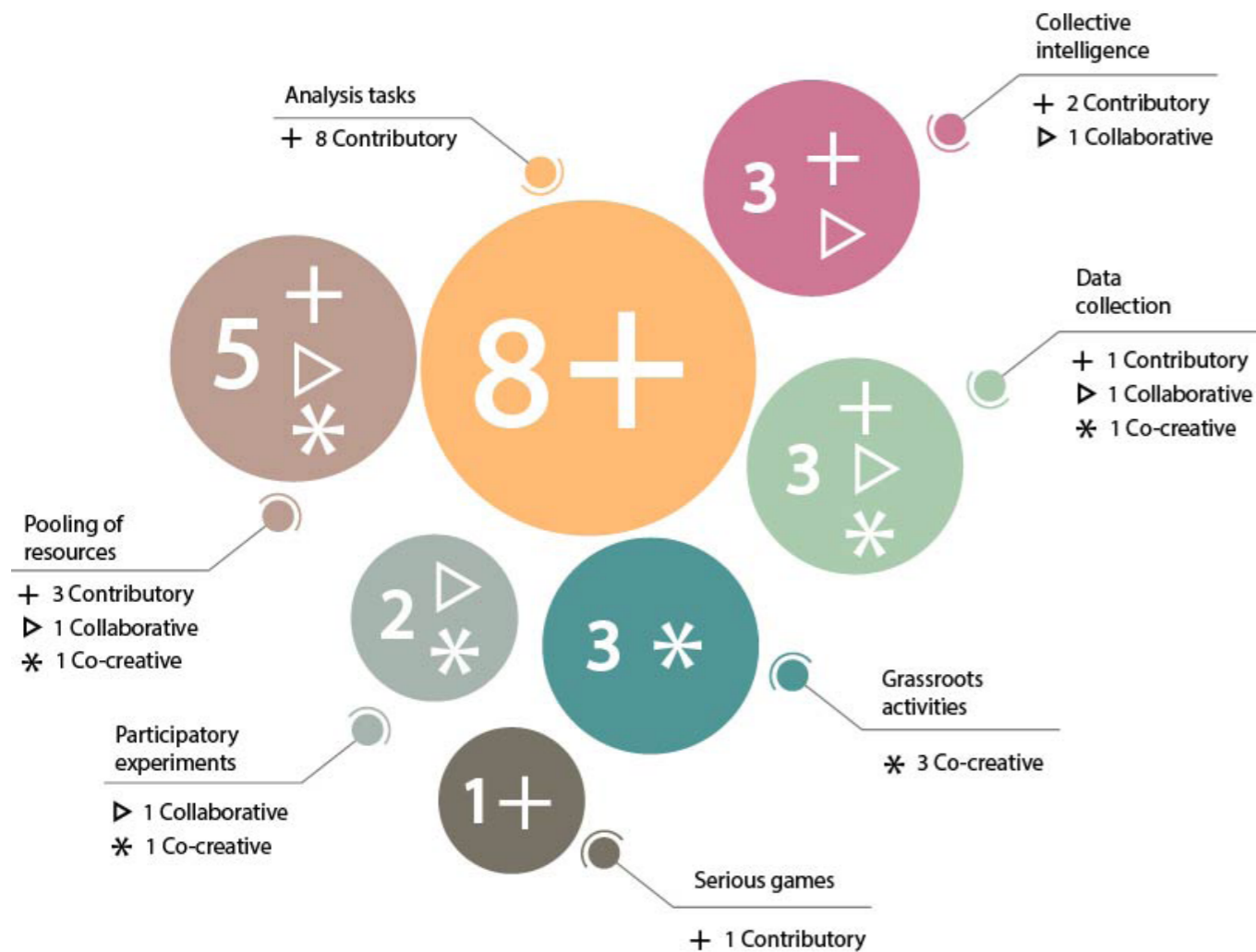


Figure 22. Combined view of the two typology items “civic engagement” (shape) and “type of participation” (colour) (aggregated view).

Chapter 6: Future Directions

6.1 Emerging challenges in citizen science

The study's objective is to identify and analyse citizen science initiatives in the cultural heritage field that engage students and staff at universities, with the ultimate goal of making them more sustainable and better connected to digital scholarship and open science. This section broadens the results of chapter 5 by further discussing the current and future challenges of the field. The topics of standards, ethics and quality are identified as vital in this context, linked to critical issues, such as a) data management, b) artificial intelligence assisted operations and c) evaluation processes respectively.

First, data management (a) in the GLAM sector is moving towards more open access, improved discoverability functions and reusability (Truyen, 2020). Successfully dealing with interoperability issues in this context is key, in order to create improved digital resources. To achieve this objective, quality assessment should be based on the adoption of effective, reliable and consensual standards. Regarding the improvement of data standardisation and credibility for citizen-generated data (as in the case of citizen science projects), the development and support of common data frameworks for structuring information is vital. The PPSR Core (Public Participation in Scientific Research, Bowser et al., 2017) has been proposed as a common global and transdisciplinary set of data models, applicable for use in citizen science projects that collect data. It integrates existing data models, aiming to formalise

a comprehensive, united structure for knowledge documentation and sharing within citizen science, aiming at higher interoperability and quality control. The model uses a threefold data schema which provides a structured way to document and describe citizen science projects through a set of core attributes. As outlined in the PPSR Core documentation, future work includes listing scientific domain areas and recommending specific domain standards for citizen science initiatives within each domain, developing new standards when they are missing and mapping common attributes across domains in order to enable cross-disciplinary analysis of diverse datasets.

Towards this direction, a growing list of domain areas (cf. natural and earth sciences, social sciences, humanities and more) is being registered as part of the Observation Data Model (ODM), one of the PPSR Core schemata, in particular under the attribute “project science type”. It is worth mentioning that, so far, humanities domain areas have been scarcely mapped compared to natural and earth sciences. Moreover, cultural heritage is missing among the designated fields. Thus, despite progress towards interoperable data models that embrace public participation in research, citizen science projects in cultural heritage are still poorly represented in existing data models. This study can be seen as an incentive to valorise citizen science projects in the cultural heritage field and urge for a reconsideration of the narrow range in representing humanities domain areas.

Regarding data standardisation, the development and support of domain-specific (meta)data models in citizen science related to cultural heritage should be stressed. Cultural heritage data are considered challenging due to their high heterogeneity, including many variations in terms based, among others, on discipline or geography. Hence, cultural heritage data can include terminology describing artefacts on a local level, yet lacking a mapped multilingual correspondence of terms, which underlines the need for the development of discipline-specific ontologies and multilingual thesauri. In this context, the digital heritage project SILKNOW (2018-2021) created a multilingual thesaurus with more than 800 terms about silk techniques related to intangible and tangible cultural heritage, making use not only of academic resources but also integrating input from practitioners (weavers). Integrating knowledge stemming from communities of practice in the development of data models should be critically taken into account within citizen or community science projects related to cultural heritage.

Second, artificial intelligence (AI) can be seen as a promising avenue in citizen science, also applicable with a cultural heritage orientation. One prominent application is using machine learning for assisting in citizen science analysis tasks related to text transcription. In this context, models can be trained to recognise specific handwritten styles of individuals or from specific chronological eras (cf. “Transcribe Bentham” project, “Read.Hanse.Sources!” project), leveraging time and minimising error in transcription processes by researchers and public participants. This advancement may gradually lead to a shift in public participation tasks, from performing at a baseline level to taking up roles in supervising the outcome of trained artificial intelligence models (see also Franzen et al., 2021). Furthermore, it may gradually lead to a shift for researchers as well, from preparing the transcription application and participation workflow to training algorithms in various tasks. At the same time, this shared agency between artificial intelligence and the public can work in reciprocal ways: participants can transcribe and evaluate data, which then can be fed into training algorithms.

AI in citizen science is increasingly being used, often taking up the form of machine learning and automated reasoning, as mapped by Ceccaroni et al. (2019) out of several citizen science software applications. Within cultural heritage, AI usage can take the form, among others, of semi-automatic tag annotations where the public can supervise and ameliorate the end-result of a trained dataset. Correspondingly, image collections that are manually classified or annotated by humans can be used to train algorithms in doing the same task in various scales. Apart from the technical aspects, the usage of AI in citizen science brings forth critical challenges in the field of ethics. The risks of AI-related to citizen science were outlined by Ceccaroni et al. (2019), and include the lack of proper acknowledgement of citizen contributors and concerns for unfair appropriation and include the lack of proper acknowledgement of citizen contributors and concerns for unfair appropriation.

Regarding AI in the field of cultural heritage at a policy level, the “EuropeanaTech AI for GLAMs task force” has started to investigate the role and impact of AI in the digital heritage domain, starting from the fields of collections analysis and (meta)data enrichment. The published analysis of the task force identified initial takeaways and issues open to investigation, including the accurate evaluation of results stemming from AI applications. The topic of citizen science and AI in the cultural heritage domain is beginning to gain traction; current issues raised share

many similar points with the broader citizen science and AI interdisciplinary field, linking to common policy references as the ethics guidelines for trustworthy AI (European Commission, 2019). However, more domain-specific paths will gradually be opened, as specialisation is expanding.

Third, quality assurance in citizen science points to the need for results-oriented project design methods and systematic approaches. Existing literature underlines the importance of stakeholder identification and analysis, in order to enhance the credibility and impact of evaluation outcomes (Skarlatidou et al., 2019; Durham et al., 2014; Bryson et al., 2011). In the case of citizen science, stakeholder groups may include, among others, civil society (several sub-categorisations can be unfolded here), local institutions, authorities, communities and the private sector. An earlier study by Bryson et al. (2011) indicated several available techniques in order to develop an informed evaluation design and usage of the evaluation outcome, by mapping and analysing in more depth engaged stakeholders. The approach of stakeholder mapping becomes particularly relevant in citizen science, where a variety of actors take part in collaborative and co-creative settings. The importance of documenting stakeholders is thus highlighted, especially those that may be overlooked or silenced (Bryson et al., 2011). Furthermore, Skarlatidou et al. (2019) provide an overview of several techniques and guidelines for stakeholder mapping and value creation in citizen science initiatives. In chapter 5 of our study, we provide commentaries on the criteria against which the selected citizen science projects are being mapped, eliciting contextual information on involved stakeholders about their roles, attributes and expertise, which can offer a complementary mapping perception (Aaltonen & Kujala, 2016).

In addition to quality assessment, evaluation in citizen science projects related to cultural heritage may be particularly connected with the fields of digitisation, collection discovery, community development and GLAM outreach activities. The GLAM-WIKI platform created a comprehensive documentation to assess projects where volunteers work together with GLAM institutions in cultural heritage-related activities by using Wikipedia (GLAM-WIKI, 2013). Evaluation indicators include cost-effectiveness of the initiative, scalability, monitoring of the GLAM-WIKI partnerships, data reports on quality enhancement and several metrics (i.e. numbers of views, edits, added content, interactions, rates and ratios of contributors, among others).

In addition, a dedicated desktop app has been developed to enable structured documentation for projects and events (i.e. editathons) related to content on Wikipedia and its related infrastructures (cf. Wikidata, Wikimedia). However, it is noted that quantitative methods are meaningful when large numbers exist, which does often not apply to citizen science projects that may be smaller in scale. The present study applied a non-scoring evaluation scheme, with the aim to provide a common language in analysing and assessing citizen science in the cultural heritage field with the use of descriptive and combined data that are structured and machine-readable, albeit with classification based on non-graded categories.

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Annex

1. Decoding the Civil War

- **Website** <https://www.zooniverse.org/projects/zooniverse/decoding-the-civil-war>
- **Status** Completed
- **Outline** Over one hundred and fifty years have passed since the end of the United States Civil War and it still captures the imagination and passion of young and old. Decoding the Civil War, funded by a two-year grant from the National Historical Publications and Records Commission (NHPRC), is a consortium project to digitise and transcribe the Union Army telegrams from The Thomas T. Eckert Papers housed at the Huntington Library. This project draws together the expertise of three organizations — The Huntington Library, Art Collections and Botanical Gardens; North Carolina State University; and the Zooniverse with its team at the University of Minnesota — with the hope that the transcription and decoding of Civil War telegrams will engage, and fire curiosity, in new and younger audiences.

2. Europeana 1914-1918

- **Website** <https://www.europeana.eu/en/collections/topic/83-1914-1918>
- **Status** Ongoing
- **Outline** Europeana 1914–1918 is a major project to digitise and publish primary and secondary historical sources on the First World War. It is coordinated by Europeana, as part of a broader program to digitise European cultural heritage. Europeana 1914-1918 was based on an initiative at the University of Oxford where people across Britain were asked to bring family letters, photographs and keepsakes from the War to be digitised. The success of the idea – which became the Great War Archive – had encouraged Europeana, Europe's digital archive, library and museum, to bring other national institutions across Europe into an alliance with Oxford University. The collaboration brought European stories online alongside their British, German, Slovenian, Luxembourgian, Irish, etc. counterparts in a World War One stories collection.

3. Altes Leipzig

- **Website** <https://www.altes-leipzig.de/>
- **Status** Ongoing
- **Outline** Leipzig's city history is firmly connected with families and their representatives. Family research meets city history. The project draws and connects the family tree of a city over 300 years with its living inhabitants. With the support of citizens of Leipzig the project tries to create a virtual city archive by collecting data of former inhabitants and buildings from the last 300 years.

4. AnnoTate

- **Website** <https://anno.tate.org.uk/#/>
- **Status** Paused
- **Outline** AnnoTate is a transcription tool developed to enable volunteers to read and transcribe the personal papers of British-born and émigré artists, including Josef Herman, Barbara Hepworth and Kurt Schwitters. Drawn from the world's largest archive of British Art – Tate Archive – participants can help to provide full text transcriptions of handwritten documents, helping to reveal the inspiration and stories behind some of the greatest works of the past century.

5. Art Detective

- **Website** <https://www.artuk.org/artdetective/>
- **Status** Ongoing
- **Outline** Art Detective aims to improve knowledge of the UK's public art collection. It is an award-winning, free-to-use online forum for specialists and others interested in resolving questions about the artworks that UK public collections hold. Launched in March 2014, Art Detective comprises a digital network built on top of Art UK's existing art object database. Art Detective is accessed through the Art UK website.

6. Citizen Archivist Dashboard

- **Website** <https://www.archives.gov/citizen-archivist>
- **Status** Ongoing
- **Outline** Capitalizing on widespread public interest in its national records, the U.S. National Archives and Records Administration (NARA) launched a project to recruit “citizen archivists”, so as to contribute by making records more accessible online. The Citizen Archivist Dashboard is NARA's online portal for engaging the public in projects that help make records easier to find online. NARA's crowdsourcing initiatives include tagging archival records, transcribing documents, subtitling historical videos, editing Wiki articles, and indexing weather observations from ship logs.

7. DIY History

- **Website** <http://diyhistory.lib.uiowa.edu/>
- **Status** Ongoing
- **Outline** An initiative from the University of Iowa Library that allows users to contribute to the historical record by transcribing and tagging primary source documents online. The University of Iowa Libraries began their first experiment in crowdsourcing with the Civil War Diaries and Letters Transcription Project. From the site's debut in the spring of 2011 to commemorate the Civil War sesquicentennial, through the fall of 2012, volunteer contributors transcribed over 15,000 pages. With the diaries and letters nearly completed, the project was expanded to include transcription opportunities for handwritten materials outside of the Civil War collections; DIY History, which also features commenting and tagging functionality for our historic photograph collections, was launched in October 2012.

8. FamilySearch

- **Website** <https://www.familysearch.org/en/>
- **Status** Ongoing
- **Outline** The Church of Jesus Christ of Latter-day Saints, Utah, USA provides FamilySearch free of charge to everyone. Originally intended for Church members, FamilySearch resources help millions of people around the world discover their heritage and connect with family members. FamilySearch indexing is a volunteer transcription effort that makes valuable genealogical records freely searchable online. Since FamilySearch indexing began in 2006, this crowdsourcing effort has produced more than one billion searchable records. Hundreds of thousands of volunteer indexers have participated from around the world.

9. GlobalXplorer

- **Website** <https://www.globalxplorer.org/>
- **Status** Ongoing
- **Outline** GlobalXplorer is an online platform that uses the power of the crowd to analyze the incredible wealth of satellite images currently available to archaeologists. Launched by 2016 TED Prize winner and National Geographic Fellow, Dr. Sarah Parcak, as her “wish for the world”, GlobalXplorer aims to bring the wonder of archaeological discovery to all, and to help better understand our connection to the past.

10. Shakespeare’s World

- **Website** <https://www.zooniverse.org/projects/zooniverse/shakespeares-world#!/>
- **Status** Completed
- **Outline** The project was a collaboration between the Folger Shakespeare Library in Washington, D.C., Zooniverse.org at Oxford University, and the Oxford English Dictionary (OED) of Oxford University Press. The project invited people to transcribe manuscripts created by thousands of men and women who were alive in and around Shakespeare’s lifetime, 1564–1616. The goals of the project were to transcribe early modern manuscripts in order to facilitate the discovery of texts in the Folger digitised collections; to create a body of early modern transcriptions that could be used for humanities research at scale; and to identify new words and word variants not represented in the OED. The project has succeeded in its goals, and the data is being used by various researchers. Nearly 6,000 pages are available on Luna, the Folger’s website.

11. Smithsonian Digital Volunteers: Transcription Center

- **Website** <https://transcription.si.edu/>
- **Status** Ongoing
- **Outline** Starting in 2013, the Transcription Center is a website connecting volunteers around the world with Smithsonian collections. This crowdsourcing project was developed as a collaborative way to digitally enable and increase public engagement with Smithsonian materials, increase access and use of digitised content, and create pathways of learning and new knowledge between the public and Smithsonian staff.

12. Archeology citizen science at Fort Vancouver

- **Website** <https://www.nps.gov/subjects/citizenscience/culture-heritage.htm>
- **Status** Completed
- **Outline** The Public Archaeology Field School and research project at Fort Vancouver National Historic Site provided an intensive program to teach citizen scientists archaeological field techniques, including survey, testing and excavation while recovering scientific data from one of the most significant archaeological sites in the Pacific Northwest. The project’s goals were to archaeologically test portions of the Vancouver Barracks to assess the scientific and historical values of the resources and to gather data on areas that may be affected by utilities upgrades and related construction activities tied to building rehabilitation, landscaping and parking. Citizen scientists collected evidence of the tangible remains of the Vancouver Barracks and earlier Hudson’s Bay Company Fort Vancouver to improve the interpretation of U.S. military- and fur trade-era history at Fort Vancouver.

13. Hawai’i Bottomfish Heritage Project

- **Website** <https://www.fisheries.noaa.gov/feature-story/hawaii-bottomfish-heritage-project>
- **Status** Ongoing
- **Outline** The project explores how the culture, traditions, and fishing techniques for the Hawaii bottomfish fishery have evolved from Native Hawaiian populations to modern times. Documenting the bottomfish “family tree”, traditional knowledge, techniques, adaptations, culture, and traditions (e.g., fish sharing), will improve the understanding of changes in the fishery over time. Specifically, the project allows for consideration of traditional values in management programs, improves interpretation of historical data, and ensures sustainable management for the future. Local fishery knowledge is an important heritage resource often lost forever when elders in the fishing community pass away. In addition, insights gathered through this research could directly support Pacific Islands Fisheries Science Center (PIFSC) stock assessment efforts, which currently work with historical commercial catch data that is lacking in context with respect to community norms and behaviors that may have influenced fisher behavior, reporting, and targeting over time.

14. EuropeanaPhotography

- **Website** <https://www.europeana-photography.eu/index.php?en/1/home>
- **Status** Completed
- **Outline** EuropeanaPhotography (EUROPEAN Ancient PHOTographic vintaGe repositoRies of digitAised Pictures of Historic qualityY) is a project governed by a consortium of 19 representatives from 13 member states, uniting some of the most prestigious photographic collections from archives, public libraries, museums and photo-agencies covering 100 years of photography - from 1839 (with the first images from Fox Talbot and Daguerre) to the beginning of the Second World War (1939). EuropeanaPhotography is funded within the Competitiveness and Innovation framework programme 2007-2013. EuropeanaPhotography prepared, quality-assured and contributed over 430,000 photographic items to Europeana, together representing a selection of masterpieces from the very beginning of photographic history.

15. Europeana Migration

- **Website** <https://www.europeana.eu/en/collections/topic/128-migration>
- **Status** Completed
- **Outline** Looking at migration to and from Europe historically, Europeana aims to show that the geographical moving of people makes culture richer. Throughout 2018, the European Year of Cultural Heritage, Europeana ran a series of collection days and events involving museums, libraries, archives and audiovisual collections across Europe that specialise in or are interested in the theme of migration. People, young and old, were invited to join in online - contributing to and exploring a migration thematic collection on the Europeana Collections website - and at cultural heritage organisations - by participating at museum events where they shared their personal migration stories, with material such as pictures, diaries, videos and letters.

16. Europeana 1989

- **Website** <https://pro.europeana.eu/project/europeana-1989>
- **Status** Completed
- **Outline** Europeana, Europe's digital library, museum and archive, launched in 2013 a project titled 'Europeana 1989'. People across Europe were invited to share their experiences, stories and memorabilia from the time of the fall of the Iron Curtain, in a digital archive. The project started in Poland with a public debate and a collection day. Europeana 1989 continued with collection days in Poland, the Baltic States, the Czech Republic, Germany and Hungary and highlighted different events from 1989. For its 25th anniversary in 2014, Europeana 1989 aims to create a vivid and personal picture of the revolutionary events in Europe with stories, photos, videos and sound. Members of the public can contribute their stories at a series of collection days in each of the countries taking part as well as via the project.

17. Europeana XX

- **Website** <https://www.europeana.eu/en/highlights-from-the-20th-century>
- **Status** Ongoing
- **Outline** A new project co-financed by the European Union under the CEF Connecting Europe Facility Programme, focused on the 20th century and its social, political and economical changes as documented in photographs, videos, and works of art. By enriching Europeana with high-quality 20th-century content, the project aims to expand the range of 20th century content available on Europeana. Semantic enrichment and automated translation will also make the content more accessible and discoverable for all audiences. Editorials addressing a wide range of 20th century phenomena will be highlighted, showcasing compelling stories and unique heritage treasures in Europeana.

18. CrowdHeritage beta

- **Website** <https://crowdheritage.eu/en>
- **Status** Completed
- **Outline** CrowdHeritage is an open platform developed with the contribution of the EC under the Connecting Europe Facility (CEF) program. The scope of the platform is to use the power of the crowd in order to improve the metadata quality of digital cultural heritage content stored in Europeana, the European portal for cultural heritage, and in the databases of cultural heritage institutions across Europe. The platform offers the possibility to cultural heritage institutions and aggregators to design and launch ad-hoc crowdsourcing campaigns for metadata quality improvement with gamification elements and verifiable results. Through these campaigns, users will be able to add annotations or validate existing ones in a user-friendly and engaging way. CrowdHeritage is an open-source platform that integrates and supports the Europeana APIs and several other available APIs from cultural institutions across the world, like the Rijksmuseum and the Digital Public Library of America). The CrowdHeritage platform has been developed by the National Technical University of Athens in collaboration with the European Fashion Heritage Association, the MICHAEL Culture Association, the Ministry of Culture of France and the Europeana Foundation.

19. Ancient Lives

- **Website** <https://www.ancientlives.org/>
- **Status** Paused
- **Outline** Ancient Lives allows citizen scientists to help transcribe ancient papyri texts from Greco-Roman Egypt. The 1,000 year old transcripts were originally found by researchers in 1896 in the city of Oxyrhynchus, often called the 'City of the Sharp-Nosed Fish'. Over the next decade, over 500,000 fragments of papyri were uncovered and the collections stands today as largely unstudied. The data gathered will help scholars reveal new knowledge of the literature, culture, and lives of Greco-Romans in ancient Egypt.

20. LanguageARC

- **Website** <https://languagearc.org/>
- **Status** Ongoing
- **Outline** LanguageARC was developed by the Linguistic Data Consortium at the University of Pennsylvania based upon work supported by the National Science Foundation. Human language technologies can help but they rely on language resources: dictionaries, grammars, texts and audio recordings that are absent or scarce for most of the world's 7000 languages. LanguageARC is working to fix that problem. Nearly all humans on the planet speak, read, understand or write at least one language qualifying them to contribute to this effort. In LanguageARC there are activities from the very simple to the challenging ones that contribute to language resources that are then shared for research, education and technology development purposes.

21. Public Editor

- **Website** <https://www.publiceditor.io/public-editor>
- **Status** Ongoing
- **Outline** Public Editor is an online community of critical thinkers vetting the most-shared news articles on the Internet. With a transparent & non-partisan process, Public Editor is engaging thoughtful citizens in a massive effort to clean up the news. Public Editor has been designed and built by a diverse team including journalists, science educators, sociologists, cognitive scientists, librarians, psychologists and software engineers.

22. Lingscape

- **Website** <https://lingscape.uni.lu/>
- **Status** Ongoing
- **Outline** Writing is everywhere in public space. All different kinds of signs and lettering form the linguistic landscape of a place or community. Often these signs display different languages, be they on the same sign or next to each other. Lingscape is an app for researching such linguistic landscapes all over the world, collecting photos of signs and lettering on an interactive map. The scope of the project is to analyze the diversity and dynamics of public writing.

23. LingoBoingo

- **Website** <https://lingoboingo.org/>
- **Status** Ongoing
- **Outline** Researchers at the University of Pennsylvania's Linguistic Data Consortium and Department of Computer and Information Science, the University of Essex, Queen Mary University of London, Sorbonne Université, Loria (the Lorraine Laboratory of Research in Computing and its Applications), Inria (the French National Institute for Computer Science and Applied Mathematics), and the Université de Montpellier have teamed up to bring together a group of online games that contribute to research in language science and technology. Lovers of language, grammar, and literature can test their knowledge, earn high scores, and compete against other players in a variety of challenging games. Simply by playing language games online, users can help create linguistic data used by researchers to improve language technologies.

24. Notes from Nature

- **Website** <https://www.zooniverse.org/projects/zooniverse/notes-from-nature>
- **Status** Ongoing
- **Outline** Most natural history collections are housed in museum cabinets, where they are not easily available to citizens and researchers. The Notes from Nature transcription project addresses this problem by digitizing biological collections one record at a time. Notes from Nature is organized into "expeditions" that volunteers can join, and in the process meet and help museum staff and biodiversity scientists working on different parts of this bigger puzzle. Notes from Nature is supported by the US National Science Foundation.

25. WeDigBio

- **Website** <https://wedigbio.org/>
- **Status** Ongoing
- **Outline** Worldwide Engagement for Digitizing Biocollections, or WeDigBio, is a global data campaign, virtual science festival, and local outreach opportunity, all rolled into one. The annual, 4-day WeDigBio event mobilizes participants to create digital data about biodiversity specimens, including fish in jars, plants on sheets, insects on pins, and fossils in drawers. During the main WeDigBio event every October, some participants are at onsite events hosted by museums, field stations, universities, science classrooms, or other organizations.

26. DigiVol

- **Website** <https://volunteer.ala.org.au/>
- **Status** Ongoing
- **Outline** DigiVol is a crowdsourcing platform that was developed by the Australian Museum in collaboration with the Atlas of Living Australia. DigiVol is used by many institutions around the world as a way of combining the efforts of many volunteers to digitise their data. This data may be in the form of museum object labels, field notebooks and diaries, recording sheets, registers or photographs. DigiVol uses several approaches of data collection in its website. Online volunteers are presented with tutorials to help them get started in joining a project (virtual expedition).

27. Re-inventing Beethoven

- **Website** <https://pro.europeana.eu/page/reinventing-beethoven>
- **Status** Completed
- **Outline** As a powerful network between cultural heritage institutions and educational sectors, the Europeana Education community launched #reinventingBeethoven - a creative educational challenge based on Beethoven's life and work for students in primary and secondary education. The principal aims of this challenge are to encourage students' creativity with cultural heritage resources and to introduce music as a powerful educational tool in the classroom for all types of subjects. Europeana invited teachers to introduce Beethoven's life and work to students and coordinate and supervise the making of a creative group artwork. Each teacher was free to use the content in their own way using Europeana materials, digital activities and games. The basic rules for participating in the challenge were to take care of students' privacy, to make sure any Europeana material used was available under Public Domain or Creative Commons licences, and to take Beethoven's life and work as an inspiration for creative artworks.

28. The Danish West-Indies

- **Website** <https://www.virgin-islands-history.org/en/>
- **Status** Completed
- **Outline** In 2017, it was 100 years before that Denmark had sold the Danish West Indies to the USA. With the support of the A.P. Møller and Chastine Mc-Kinney Møller Foundation for General Purposes and the Danish Ministry of Culture, the Danish National Archives has commemorated the centennial by presenting the original records and the history of the colonial period. The Danish National Archives' digitization project "The Danish West Indies – Sources of history" lasted four years with volunteers working to transcribe the records and make them searchable.

29. Scribes of the Cairo Geniza

- **Website** <https://www.scribesofthecairogeniza.org/>
- **Status** Ongoing
- **Outline** Scribes of the Cairo Geniza is a project with the ultimate goal of transcribing Cairo Geniza fragments. With an in-kind grant from the Zooniverse, the largest crowdsourcing platform in the world, along with institutional and image partners from The University of Pennsylvania Libraries, The Princeton Geniza Lab, The e-Lijah Lab and the Centre for Interdisciplinary Research of the Cairo Genizah at the University of Haifa, the Library of the Jewish Theological Seminary, the Genizah Research Unit at Cambridge University Library, The University of Manchester Library, and The Bodleian Libraries at the University of Oxford, the project harnesses the power of technology to decipher some of the most difficult to read fragments in the world.

30. Fishing in the past

- **Website** <https://www.zooniverse.org/projects/anneoverduin/fishing-in-the-past>
- **Status** Completed
- **Outline** The project collected a large amount of information (concerning species, names, pictures, spatial distribution, and uses/functions) about European aquatic animals in the 16th-19th centuries through the analysis of paintings. Art is an underrated source of information. Between 1500 and 1850 fish was a popular subject for painters. Still-lives and market scenes give an idea of the use of fishes in the past. In this project, people from art and social science work together with biologists and fish experts. The result is a gathering of information about fish in the past that may help to shed new light on issues such as long-term European biodiversity.

31. Project PHaEDRA

- **Website** <https://library.cfa.harvard.edu/project-phaedra>
- **Status** Ongoing
- **Outline** Project PHaEDRA is an initiative by the Wolbach Library, in collaboration with several partners, to catalog, digitise, transcribe, and enrich the metadata of over 2500 logbooks and notebooks produced by the Harvard Computers and early Harvard astronomers. The goal is to ensure that this remarkable set of items, created by a remarkable group of people, is as accessible and useful as possible.

32. Macdonald Dictionary

- **Website** <https://www.zooniverse.org/projects/christopherthomson/macdonald-dictionary>
- **Status** Ongoing
- **Outline** This project is a collaboration between Canterbury Museum and the University of Canterbury, both located in Christchurch, New Zealand. The G. R. Macdonald Dictionary of Canterbury Biographies, presented to Canterbury Museum in 1964 and comprised of over 12,000 index cards, provides an extensive collection of biographical information about the Canterbury region. The Dictionary, however, lacks indexed information on women, as the biographical cards were traditionally organised by the male heads of the households. By transcribing names and supporting information, this project will, to an extent, address this bias and provide a much better searchable index of names for research use.

33. Heritage Monitoring Scouts

- **Website** <https://hms.fpan.us/about>
- **Status** Ongoing
- **Outline** Heritage Monitoring Scouts (HMS Florida) is a public engagement program focused on tracking changes to archaeological sites at risk, particularly those impacted by climate change in the form of erosion and sea level rise. The public is encouraged to apply to the program and will receive monthly updates on training and resources available for HMS Florida participants statewide. In order to participate in the program, Scouts use the HMS Florida Arches Database. The Arches Database is an interactive, map-based website where Scouts can view cultural resources across Florida and log Scout Reports for monitoring visits.

34. Maine Midden Minders

- **Website** <https://umaine.edu/middenminders/>
- **Status** Ongoing
- **Outline** The Midden Minders program is a citizen-science based project designed to monitor and document the erosion of many of the approximately 2000 archaeological shell middens on the Maine coast. Virtually all these sites are eroding in the face of climate change, induced sea level rise and increasing weather variability. While frequently understated in the historical New England narrative, these features represent thousands of years of cultural and environmental information. Midden Minders volunteers provide data for informed cultural resource management decisions by using simple tools to measure and record human and natural midden change. Information is archived in a database designed to protect site location and landowner privacy in a format that can be used by both heritage managers and researchers. Volunteers receive training through the program website or in sessions sponsored by conservation organizations. This collaborative effort between professionals and citizen scientists marks a new direction for Maine archaeology.

35. Europeana Fashion Edit-a-thons

- **Website** https://meta.wikimedia.org/wiki/Europeana_Fashion_edit-a-thons/Europeana_Fashion_Challenge/Welcome_to_the_Challenge
- **Status** Completed
- **Outline** In an effort to improve fashion knowledge on the web, Europeana Fashion has organised a series of GLAM-WIKI edit-a-thons with fashion institutions around Europe, engaging cultural heritage professionals, scholars, students and fashion enthusiasts in the editing of new and existing voices on Wikipedia, reusing digital content released under open licenses by selected cultural heritage institutions. An editathon is an event where people get together to edit Wikipedia, usually focusing on a specific topic. Improving Fashion Knowledge, Europeana Fashion aims not only to gather hundreds of thousands of digitised fashion objects, but also to increase the amount of fashion knowledge on the web and make it more visible.

36. Herbaria@home

- **Website** <http://herbariaunited.org/atHome/>
- **Status** Completed
- **Outline** The Herbaria@home project represents a novel approach to documenting museum herbarium collections. By making an archive of images of undocumented herbarium sheets available online, the project allows the public to have direct involvement in, and responsibility for, creating specimen-level museum documentation. The project creates highly structured, detailed and scientifically useful records of herbarium specimens. Record quality and accuracy are maintained by peer-review and by making good use of the expertise of the volunteer user-base. This is an ideal way of making botany collections accessible and useful to a wide and diverse audience. The project provides an opportunity to promote public insight into, and involvement in, museum documentation work that is normally hidden away and inaccessible. The resulting botanical data-sets and images are made freely available. The project launched as a pilot toward the end of 2006, but has seen continuous development and growth throughout 2007. To date over 17,000 specimens have been documented. Work on particular collections has received support and funding from the Botanical Society of British Isles, but development and maintenance of the website and software has been done on an entirely voluntary basis without any institutional funding.

37. Click! A Crowd-Curated Exhibition

- **Website** <https://www.brooklynmuseum.org/opencollection/exhibitions/3168>
- **Status** Completed
- **Outline** Click! is a photography exhibition that invites Brooklyn Museum's visitors, the online community, and the general public to participate in the exhibition process. Click! is an exhibition in three consecutive parts. (1) It begins with an open call—artists are asked to electronically submit a work of photography that responds to the exhibition's theme, "Changing Faces of Brooklyn," along with an artist statement. (2) After the conclusion of the open call, an online forum opens for audience evaluation of all submissions; as in other juried exhibitions, all works will be anonymous. As part of the evaluation, each visitor answers a series of questions about his/her knowledge of art and perceived expertise. (3) Click! culminates in an exhibition at the Museum, where the artworks are installed according to their relative ranking from the juried process. Visitors will also be able to see how different groups within the crowd evaluated the same works of art. The results will be analyzed and discussed by experts in the fields of art, online communities, and crowd theory.

38. What's on the Menu?

- **Website** <http://menus.nypl.org/about>
- **Status** Ongoing
- **Outline** With approximately 45,000 menus dating from the 1840s to the present, The New York Public Library's restaurant menu collection is one of the largest in the world, used by historians, chefs, novelists and everyday food enthusiasts. Citizens are involved in transcribing the menus, dish by dish, to expand the archive. The ultimate goal is to get the whole collection transcribed and to make the data available for exploration and use by researchers, educators, chefs and other interested folks.

39. Wreck History

- **Website** <https://vbn.aau.dk/en/publications/cities-at-play-childrens-redesign-of-deprived-neighbourhoods-in-m>
- **Status** Completed
- **Outline** This project involved 25 children from a school located in an exposed area in southern Copenhagen, aged 13–15. The redesign process was conducted as part of science education in eighth grade. The specific area in southern Copenhagen has problems with organized crime and gangs and is defined as a focus area for various projects administrated by the City of Copenhagen. A community-driven science gaming process was designed in which overall challenges for redesign, defined by urban planners, were given to the students to highlight their local knowledge about living conditions and solutions for the problems identified. As part of the process, students were introduced to central concepts in urban planning defined by leading Danish architects. Over four days, the students defined problems and potentials of the area, constructing models for redesigning the neighbourhood in Minecraft and LEGO. These were presented to City of Copenhagen architects and urban planners as well as the head of the Department of Transport, Technology and Environment.

40. Cities at Play

- **Website** <https://vbn.aau.dk/en/publications/cities-at-play-childrens-redesign-of-deprived-neighbourhoods-in-m>
- **Status** Completed
- **Outline** This project involved 25 children from a school located in an exposed area in southern Copenhagen, aged 13–15. The redesign process was conducted as part of science education in eighth grade. The specific area in southern Copenhagen has problems with organized crime and gangs and is defined as a focus area for various projects administrated by the City of Copenhagen. A community-driven science gaming process was designed in which overall challenges for redesign, defined by urban planners, were given to the students to highlight their local knowledge about living conditions and solutions for the problems identified. As part of the process, students were introduced to central concepts in urban planning defined by leading Danish architects. Over four days, the students defined problems and potentials of the area, constructing models for redesigning the neighbourhood in Minecraft and LEGO. These were presented to City of Copenhagen architects and urban planners as well as the head of the Department of Transport, Technology and Environment.

41. Picture Pile

- **Website** <https://geo-wiki.org/games/picturepile/>
- **Status** Ongoing
- **Outline** The Picture Pile application is a generic and flexible tool for ingesting imagery that can then be rapidly classified by volunteers. These images can be very high-resolution satellite images, orthophotos, images from UAVs or geotagged photographs. Volunteers are asked a simple question related to the theme of the images, e.g., do you see evidence of settlements? If the answer is yes, the volunteer swipes the image to the right, if no, to the left and if maybe, to the bottom. Picture Pile was originally called Cropland Capture and was used to collect more than 5 million assessments of cropland. As a more generic tool, it has been used to collect data on deforestation, building damage from Hurricane Matthew, cloud cover, nighttime lights, oil palm plantations and poverty assessment.

42. News Evaluator

- **Website** <https://geo-wiki.org/games/picturepile/>
- **Status** Completed
- **Outline** In the "News Evaluator" mass experiment, researchers and pupils studied the type of news in young people's online news feeds. Using a digital tool, pupils categorised and evaluated the credibility of the news in a scientific way. The News Evaluator project started in 2017 as a mass experiment, run as part of the European Researchers' Night in Sweden. As part of the second phase of the project, a News Evaluator Election Special was run in September 2018, whereby pupils helped researchers investigate political news in young people's digital feeds prior to the Swedish general election. A revised and translated version of the digital tool was also used by thousands of Danish teenagers in September 2019. A final version of the digital tool was launched in November 2020. The News Evaluator is a collaboration between the Swedish non-profit organisation VA (Public & Science), Uppsala University and RISE – Research Institutes of Sweden.

43. SPIN: Scalable Peirce Interpretation Network

- **Website** <https://sites.google.com/site/spinpeirce/home>
- **Status** Ongoing
- **Outline** The motivating ideas underlying the SPIN project largely stem from a widespread sense of frustration due to the fact that, several decades into the digital revolution, many sets of significant manuscripts in science, mathematics and logic are still available only in handwritten form. In particular manuscripts having mathematical formulas, figures and diagrams pose a special set of problems for collaborative transcription projects—especially those that intend to employ crowdsourcing strategies. The primary goal of the SPIN project is to design, develop and test (1) a social and technical model for transcription infrastructure and (2) an enhanced set of open and interoperable encoding platforms that will help libraries bring the significant archival collections of complex scientific, mathematical, logical and financial manuscripts out of the silos in which they have been housed and make them widely accessible online in a searchable form.

44. tag.check.score.

- **Website** https://www.fokus.fraunhofer.de/go/tag_check_score
- **Status** Ongoing
- **Outline** The Ethnological Museum Berlin (EMB) has many untapped digitised data sets. These are not searchable because the meta-information to the images is missing. Fraunhofer FOKUS and the EMB have joined forces to solve this problem and developed the crowdsourcing app Tag.Check.Score. Users help enrich these images with information by using predetermined categories and tags. The entries of other users are also checked by users in order to avoid errors. Civil society multiplies the performance of the individual within the framework of a "digital honorary office". The newly obtained data is available to the museum via an export function, so that it can be transferred into its own system, checked and supplemented with historical specialist information. Due to the resulting metadata, the image collection can be made available to the general public via the museum system as well as other platforms. The crowdsourcing app "Tag. Check. Score." was technically realized by the Code for Europe Fellow together with Fraunhofer FOKUS.

45. Micro Pasts

- **Website** <https://crowdsourced.micropasts.org/>
- **Status** Ongoing
- **Outline** MicroPasts is a free and open-source, crowd-sourcing platform which supports massive online data collection about the human past (e.g. for researchers in archaeology, history and heritage). MicroPasts is developing example projects for common research tasks that require either widespread user contributions (such as on-location photography) or human intelligence (such as geocoding, image classification, transcription and more). In the future, it also wishes to help researchers in archaeology, history and heritage to create their own crowd-sourcing projects from scratch and host them. All the software and data is placed immediately into the public domain under an open license.

46. DUNA: Digitally Unlocking Nature's Archive

- **Website** <https://www.zooniverse.org/projects/nhmlibraryarchives/duna/>
- **Status** Ongoing
- **Outline** The UK Natural History Museum's Library and Archives is the national resource for natural historians, researchers, artists and academics. It has been developing its unparalleled collection of natural history literature, artwork and information resources since the Museum opened in 1881. A rich reservoir of scientific, historical and social research data is locked in the handwritten documents, illustrations and artwork collections. Through the projects made available via DUNA, the objective is to harness the power of the crowd to unleash this data via tools such as transcription and tagging and make it digitally discoverable, accessible and open to all for the first time.

47. Every Name Counts

- **Website** <https://www.zooniverse.org/projects/arolsen-archives/every-name-counts>
- **Status** Ongoing
- **Outline** The Arolsen Archives are an international center on Nazi persecution with the world's most extensive collection of documents on the victims and survivors of National Socialism. The collection is listed on the UNESCO Memory of the World register. The archive contains around 30 million documents with references to the fates of 17.5 million people. Many millions of names can already be easily searched, but not nearly all of them. The project aims to create the world's largest Online Archive of documents on the victims and survivors of National Socialism – which will be a digital memorial to the people who were persecuted.

48. Measuring the ANZACS

- **Website** <https://www.zooniverse.org/projects/zooniverse/measuring-the-anzacs>
- **Status** Ongoing
- **Outline** The Measuring the ANZACS project brings together an international team of researchers, community connections around New Zealand's military history from the Auckland War Memorial Museum, and the power of the Zooniverse community to explore, analyze, and digitise original World War I personnel files from Archives New Zealand. Measuring the ANZACS builds on work done by Archives New Zealand to complete an organized digital collection of all the pages in the personnel files for people serving in the New Zealand military in South Africa and World War I. All of the data collected by Measuring the ANZACS will be made freely available to the public for research.

49. Spotteron

- **Website** <https://www.spotteron.net/>
- **Status** Ongoing
- **Outline** The SPOTTERON Citizen Science Platform offers a customizable and affordable system for applications in the areas of Citizen Science, environmental protection and volunteer monitoring. In cooperation with research projects, Spotteron develops independent smartphone apps for Android and IOS, interactive applications for browsers such as map applications or citizen science games, and provides a stable and reliable platform for projects.

50. Witnesses

- **Website** <https://en.getuigenissen.org/>
- **Status** Ongoing
- **Outline** Witnesses is a VUB (Vrije Universiteit Brussel) and FWO (the Flanders Research Foundation) co-financed digitalization project that strives to gather, digitise and transcribe witness depositions and suspect interrogations preserved at criminal courts in 18th and 19th century Belgium. It is a collaboration between four research groups at the Vrije Universiteit Brussel (History, Linguistics, Sociology and Criminology), together with the State Archives and Histories (Platform of Cultural Heritage Organizations in Flanders and Brussels). Witnesses is embedded in the recent fields of citizen science and Digital Humanities, with the intention to improve and support digitalization within the Humanities.

51. VeleHanden

- **Website** <https://velehanden.nl/>
- **Status** Ongoing
- **Outline** Picturae is a Dutch company active in digitizing and unlocking heritage collections for museums, archives and libraries at home and abroad. VeleHanden is the crowdsourcing website of Picturae where archives and museums offer their digitised collections for access to the general public. The aim is to make collections searchable and to ensure that they are available online for everyone. More than 40,000 volunteers have so far joined the effort.

52. Wikidocumentaries

- **Website** <https://wikidocumentaries-demo.wmflabs.org/>
- **Status** Ongoing
- **Outline** Wikidocumentaries is a wiki for small history and for all historians: amateurs, scholars and all citizens interested in history. It is based on the existing content in Wikimedia projects combined with media made available in libraries, archives and museums. Topics from Wikimedia are complemented with smaller and lesser topics from the users. Everyone can investigate the archives of cultural heritage from their own perspective, combine materials into narratives, enrich them with additional information and share with communities of their liking.

53. Depictathons

- **Website** <https://commons.wikimedia.org/wiki/Commons:Depictathons>
- **Status** Completed
- **Outline** Small-scale event for the enrichment of Wikimedia Commons metadata, inviting GLAMs and indigenous communities. GLAMs contribute a small set of images pertaining to the participating community and the community represented in them document the images using their own concepts and languages.

54. Wiki Loves X

- **Website** https://meta.wikimedia.org/wiki/Wiki_Loves_X
- **Status** Ongoing
- **Outline** Month-long Wikimedia community organised events designed as outreach campaigns for crowdsourcing content based on a certain concept series. For example, Wiki Loves Monuments is one of the most consistent and successful campaigns related to the topic of cultural heritage.

55. Fortepan Iowa

- **Website** <https://fortepanstage.uni.edu/about/>
- **Status** Ongoing
- **Outline** The project, based at the University of Northern Iowa, duplicates and builds upon the hugely successful Hungarian public website "Fortepan", an interactive photo chronology developed by Miklós Tamási and András Szepessy in 2009. The name "Fortepan" comes from the Hungarian company FORTE, which made the popular black and white negative "Fortepan" film that was sold throughout the world after World War II until 2001. Fortepan Iowa features curated historical photos taken by ordinary Iowans over the nineteenth and twentieth century. The photos represent the personal, whimsical, poetic, significant, and accidentally artistic moments of everyday Iowa life, and tell a rich story of Iowa's great diversity and complexity. The project serves as an ever-growing public website, providing opportunities for deep reflection on aspects of Iowa as a State.

56. Punjabi Wikisource pilot

- **Website** https://meta.wikimedia.org/wiki/Punjabi_Wikimedians/Punjabi_Wikisource_SDOC_Pilot
- **Status** Completed
- **Outline** One of the 7 official small-scale GLAM pilots as part of the Structured Data on Wikimedia Commons project (2017-2019). Technically, the project tackled the potential of reusing data specifically for documentary heritage between various Wikimedia components: Wikidata, Wikimedia Commons and Wikisource (a digital library of public domain and freely licensed texts), improving the workflow of contribution between them. The project involved digitisation and bibliographical metadata work from the Punjabi community and Wikimedia community for around 30 rare books belonging to the Qisa genre (Punjabi language oral story-telling tales with Perso-Islamic roots).

57. Balinese palm-leaf transcription

- **Website** https://meta.wikimedia.org/wiki/Grants:Project/PanLex/Balinese_palm-leaf_transcription_platform_on_Wikisource
- **Status** Ongoing
- **Outline** A large collection of Balinese palm-leaf manuscripts (130.000 leaves) started being transcribed as machine-readable text and transliterated into Indonesian and English, including the creation of a web app specifically for the transcription of Balinese manuscripts. The project received a Wikimedia Foundation GLAM-focused grant and is managed by the non-profit PanLex in coordination with the Internet Archive and Udayana University.

58. Wikipedia, women, indigenous languages and ancestral knowledge from the global south in the Colombian context

- **Website** https://meta.wikimedia.org/wiki/Grants:Project/ISUR/Wikipedia_women_and_ancestral_knowledge_from_the_global_south_in_the_Colombian_context/2
- **Status** Ongoing
- **Outline** "Wikipedia, women, indigenous languages and ancestral knowledge from the global south in the Colombian context" is a public and open social project for people to participate on the Internet, share knowledge, access knowledge, experiment and develop ideas and projects in a collaborative, free and open way through Wikipedia. The objective is for this project to benefit indigenous peoples in terms of public social development programs (education, access to information, participation, etc.). This project aims to support the different processes taking place in three indigenous peoples and to empower women's voices and participation through the use of Wikipedia.

59. Georeferencer

- **Website** <http://britishlibrary.georeferencer.com/start>
- **Status** Ongoing
- **Outline** Project of the British Library (active since 2015) partnering with Wikimedia with the objective to georeference over 50,000 old maps and plans found in the Mechanical Curator collection (approx. 1 million images mechanically extracted from digitised 19th century books and uploaded by the British Library to Flickr Commons). Up to 73% has been digitised so far with the contribution of members from the public. The georeferencing interface enables people to plot locations on historic maps by comparing a digitised image with present-day online maps.

60. Tumak-i

- **Website** <https://fortepanstage.uni.edu>
- **Status** Ongoing
- **Outline** Documentation of Turkish folklore, in particular oral folktales of the Anatolian plateau. Members of the public and academics can submit fairytales to the online portal, where it is then examined by three rounds of researchers and language editors. The project is considered the first of its kind in Turkey; it was launched in 2019 and will last 3 years.

61. Maori Women Weavers

- **Website** https://en.wikipedia.org/wiki/Wikipedia:Meetup/Wellington/M%C4%81ori_Women_Weavers_Editathon
- **Status** Completed
- **Outline** This edit-a-thon focuses on improving the presence of Māori women weavers in both Wikipedia and Wikidata. It is intended that articles and items relating to Māori weaving are improved along with those relating to Māori weaving organisations. This was an informal event with no presentations on learning how to edit Wikipedia but instead focused on improving Wiki content. There were three physical locations for this meetup on the 7th of January 2021 in New Zealand. The focus of this editathon is the improvement of current articles on Māori women weavers in English Wikipedia with the aim that these be available for reuse and also translation into other languages.

62. Kino in der DDR

- **Website** <https://projekte.uni-erfurt.de/ddr-kino/>
- **Status** Ongoing
- **Outline** "Cinema in the GDR - Reception History of 'Below'" is a research project of the University of Erfurt. It is located at the Interdisciplinary Research Centre for Historical Media (IFhM). The project is supported by the Thuringian Construction Bank. A special technical platform makes it possible to locate former cinemas on a historical map or to share digital recordings of photos, books and cinema tickets with the research team. The information and materials provided by citizens help to better understand the reality of life of the people of the GDR in relation to cinema.

63. GIRT

- **Website** <https://www.girtsd.org/>
- **Status** Ongoing
- **Outline** The destruction of underwater cultural heritage (UCH) has increased rapidly in the last two hundred years mainly driven by direct and indirect impact from people's actions. Gathering Information via Recreational and Technical (GIRT) Scientific Divers is a conservation focused no-impact citizen-science project. It aims to train members to systematically document observable physical and natural features of historic shipwrecks, submerged aircraft and other underwater cultural heritage in an open sea water environment, to facilitate their ongoing protection and management. The focus of the GIRT citizen science project is to enable better understanding of the condition of sites and the factors driving their preservation or deterioration. It also aims to encourage interested people to have an active and positive public archaeology role.

64. Alone in a crowd ...transcribing together

- **Website** <https://cambridge-digital-library.github.io/Crowdsourcing/>
- **Status** Ongoing
- **Outline** A crowd-sourcing project by Cambridge Digital Library with a prototype use of GitHub (tags, versioning, contribution tracking, etc) for text transcription, undertaken during the University of Cambridge's closure period due to the Coronavirus outbreak in 2020. The project is helpful for transcribing digitised materials that do not belong to any existing research project.

65. Mutual Muses

- **Website** <https://www.zooniverse.org/projects/melissaagill/mutual-muses>
- **Status** Completed
- **Outline** The first crowdsourced transcription project of the Digital Art History program at the Getty Research Institute in 2017, including transcription data for 2,376 documents from art historical letters (the archives of art critic Lawrence Alloway and feminist artist Sylvia Sleigh), as well as code used for processing and analyzing the data results and producing file outputs. The transcription of these letters contributed to the field of art history in general and the field of modern art in particular. The outcome of this project will be delivered to the Getty Research Institute's Special Collections department and made available online.

66. Alberta COVID-19 Community Archive

- **Website** <https://pbinkley.github.io/wax-community-archive/>
- **Status** Ongoing
- **Outline** Launched in May 2020, the Alberta COVID-19 community archive was inspired by Brock University Library Niagara Archive and other Libraries and Archives initiatives to capture this historic moment in time. This research collection would provide future scholars an important view on how Alberta was impacted by the pandemic. By allowing for a more community driven approach to collecting, the project is hoping to provide an alternative view to what is being captured in institutional archives and the media.

67. In the Spotlight

- **Website** <https://www.libcrowds.com/collection/playbills>
- **Status** Ongoing
- **Outline** The project asks for public participation for helping make British Library's collections of popular entertainment from the past 300 years (historical playbills) easier to find by transcribing names and performances on the playbills of Britain's old theatres. The British Library holds a significant collection of playbills dating from the 1730s to the 1950s. These playbills list entertainments at theatres, fairs, pleasure gardens and other such venues. Small 'handbills' were circulated amongst theatre-goers enjoying the performance while larger 'great bills' were posted on walls and windows. The Library's collection of approximately 234,000 playbills has been bound into over 1000 volumes, some of which have been digitised. This project is run by the British Library's Digital Scholarship and Printed Heritage teams.

68. Comunidad BNE

- **Website** <https://comunidad.bne.es/>
- **Status** Ongoing
- **Outline** The platform of the National Library of Spain for the development of collaborative work projects on digital heritage with several active and completed projects including tasks in identification and transcription, georeferencing, audio transcription, marking and labeling, data enrichment and OCR correction.

69. History Unfolded – US Newspapers and the Holocaust

- **Website** <https://newspapers.ushmm.org/>
- **Status** Ongoing
- **Outline** History Unfolded is a project of the United States Holocaust Memorial Museum in Washington, DC. It asks students, teachers, and history buffs throughout the United States what was possible for Americans to have known about the Holocaust as it was happening and how Americans responded. Participants look in local newspapers for news and opinion about 41 different Holocaust-era events that took place in the United States and Europe, and submit articles they find to a national database, as well as information about newspapers that did not cover events. History Unfolded raises questions for scholars and will inform the Museum's initiative on Americans and the Holocaust.

70. Fortepan

- **Website** <https://fortepan.hu/>
- **Status** Ongoing
- **Outline** Fortepan is a free-to-use community photo archive where you can browse and download over a hundred thousand archive photos. The website was launched in 2010 with five thousand photos, mostly found on trash cans. Since then, hundreds of families, amateur and professional photographers, and public collections have expanded Fortepan. The images on the website are selected by the editorial staff.

71. Linked Jazz

- **Website** <https://linkedjazz.org/52ndStreet/>
- **Status** Ongoing
- **Outline** A project by the School of Information Science at the Pratt Institute that applies Linked Open Data (LOD) technology to enhance the discovery and visibility of digital cultural heritage materials. Utilizing documents from digital archives of jazz history, Linked Jazz works to expose the social relationships between jazz musicians and reveal their community's network. This project aims to help uncover meaningful connections between documents and data related to the lives of musicians who often practice in rich and diverse social networks.

72. Tagger

- **Website** <https://artuk.org/about/tagger>
- **Status** Paused
- **Outline** Tagger was a crowd-sourcing project inviting the public to tag art with words and also put artworks into categories. The resulting tags allow visitors to use Art UK to search artworks by subject matter. Tagger was created in partnership with the Citizens Science Alliance team based in the Astrophysics Department at the University of Oxford, and staff at the Art History Department at the University of Glasgow.

73. California Digital Newspaper Collection

- **Website** <https://cdnc.ucr.edu/cgi-bin/cdnc>
- **Status** Ongoing
- **Outline** The California Digital Newspaper Collection is a project of the Center for Bibliographical Studies and Research (CBSR) at the University of California, Riverside. The CDNC is supported in part by the U.S. Institute of Museum and Library Services under the provisions of the Library Services and Technology Act, administered in California by the State Librarian. The California Digital Newspaper Collection contains over 1,500,000 pages of significant historical California newspapers published from 1846-present, including the first California newspaper, the Californian, and the first daily California newspaper, the Daily Alta California. It also contains issues of several current California newspapers that are part of a project to preserve and provide access to contemporary papers.

74. Amplify: transcribe the voices of Queensland

- **Website** <https://artuk.org/about/tagger>
- **Status** Paused
- **Outline** The State Library of Queensland invites digital volunteers to improve the accuracy of digitised oral histories from State Library's collections alongside automatically generated transcripts, through the library's platform Amplify.

75. Het Vrije Volk

- **Website** <https://archieff.amsterdam/>
- **Status** Ongoing
- **Outline** Thousands of photographs from the archive of newspaper Het Vrije Volk document the notable events in Amsterdam in the twentieth century. The photos from the newspaper archive are broadly classified by subject, but not described per piece. The City Archive now wants to change that, so that the photos can be shown online in the Image Bank. The backs of the photos can be used as a tool when describing.

76. Dutch Species Register

- **Website** <https://www.nederlandsesoorten.nl/>
- **Status** Ongoing
- **Outline** Naturalis Biodiversity Center and partners strive to provide a complete picture of Dutch biodiversity. Photo material is becoming available for more and more species, but there are still many gaps in the supply. In addition to species for which no photo is available yet, the Center also wants to show the variation within these species. The common goal is to create an, as complete as possible, image bank of Dutch plants, animals and fungi which can then be widely used.

77. Historiana

- **Website** <https://historiana.eu/>
- **Status** Paused
- **Outline** Historiana offers free historical content, ready to use learning activities, and innovative digital tools made by and for history educators across Europe, on topics such as history and heritage. Educational scenarios can become non-formal learning activities or research activities for younger ages. The platform has also a list of curated micro-collections (on several historical/heritage topics).

78. Images for the future

- **Website** <https://www.beeldengeluid.nl/en/knowledge/projects/images-future>
- **Status** Completed
- **Outline** In the Images for the Future project, Sound and Vision, together with Nationaal Archief, EYE Film Instituut Nederland and Kennisland, ensures that an important part of the Dutch national heritage in the audiovisual field is preserved for future generations. With preservation and digitization the acute threat of decay and loss of films, video and audio tapes, and photos is averted. The various digitised collections are made accessible to a wide audience. The project started in July 2007 and lasted 7 years. The project was funded by the FES (Fonds Economische Structuurversterking).

79. DigiBird

- **Website** <http://www.digibird.org/>
- **Status** Completed
- **Outline** DigiBird was conceived as an infrastructure/system that integrates cultural heritage data on the fly, using nature as its thematic, focusing on birds. The DigiBird pipeline and API can be used by heritage institutions to overcome the challenge of integrating crowdsourcing results into their collections, by embedding the results of combined crowdsourcing efforts, performing different tasks (e.g. metadata extension, contribution of media objects) into their online collections.

80. Transcribathon

- **Website** <https://transcribathon.eu/>
- **Status** Ongoing
- **Outline** The first prototype of the Transcribathon tool was created in 2014 by Facts & Files and Olaf Baldini/Piktorsk and funded by the German Federal Government Commissioner for Culture and the Media (BKM). The tool was further developed in 2016 into the Transcribathon Europeana 1914-1918 website, which focused on the transcription of documents from the Europeana 1914-1918 collection, co-funded by the European Commission. In 2019, the Transcribathon platform was updated, improved and extended within the framework of the Enrich Europeana project, which, among other improvements, now enables the incorporation of multiple digital heritage collections. The Enrich Europeana project is jointly developed by the Austrian Institute of Technology, Facts & Files, Europeana, NET7, Biblioteca Județeană "Octavian Goga" Cluj, the Austrian National Library and Poznań Supercomputing and Networking Center, and co-funded by the Connecting Europe Facility of the European Union.

81. Letters 1916-1923

- **Website** <http://letters1916.maynoothuniversity.ie/>
- **Status** Ongoing
- **Outline** Letters 1916-1923 is Ireland's first participatory digital humanities project. It began in September 2013 as Letters 1916, in 2017 it expanded its collection period to the end of the Civil War through a generous grant from the Irish Research Council. This digital collection includes letters held at institutions in Ireland and abroad alongside those in private collections. Letters 1916-1923 adds a new perspective to the events of the period, a confidential and intimate glimpse into early 20th Century life in Ireland, as well as how Ireland was viewed abroad. The project has over 2,000 transcribers.

82. Digitizing our shared UNESCO history

- **Website** <https://digital.archives.unesco.org/en/>
- **Status** Ongoing
- **Outline** UNESCO's institutional archives and historical audiovisual collections contain evidence of over 70 years of ideas and actions for peace and international understanding that span the Organization's wide-ranging fields of competence. In 2015, UNESCO launched a fundraising project to digitise the Organization's archives dating back to its predecessors, including the League of Nations' International Institute for Intellectual Cooperation. The project is an important step in preserving key parts of our collective memory and in making these records more readily available to the public. The Digitizing Our Shared UNESCO History project has digitised an important selection of over 5,000 of the Collection's photographic prints (recto and verso, totaling 10,000 scans).

83. CITIZAN

- **Website** <https://citizan.org.uk/>
- **Status** Ongoing
- **Outline** CONECT-e, Compartiendo el CONocimiento ECológico Tradicional, is a platform for sharing and preserving traditional ecological knowledge, recognised as part of the intangible humanity heritage. Most of the scientific team are ethnobotanists or farmers while participation in the platform is open to the public.

84. CONECT-e

- **Website** <https://www.conecte.es/index.php/es/>
- **Status** Ongoing
- **Outline** The Church of Jesus Christ of Latter-day Saints, Utah, USA provides FamilySearch free of charge to everyone. Originally intended for Church members, FamilySearch resources help millions of people around the world discover their heritage and connect with family members. FamilySearch indexing is a volunteer transcription effort that makes valuable genealogical records freely searchable online. Since FamilySearch indexing began in 2006, this crowdsourcing effort has produced more than one billion searchable records. Hundreds of thousands of volunteer indexers have participated from around the world.

85. Smapshot

- **Website** <https://smapshot.heig-vd.ch/>
- **Status** Ongoing
- **Outline** The goal of Smapshot is to 3D geolocalise archive images by recreating a virtual globe of past time. The photographs from various collections go back in time to the end of the 19th century with a very high resolution. The platform allows volunteers to align the images with the virtual globe and thus geolocate them in 3 dimensions.

REFERENCES

- Aaltonen, K., & Kujala, J. (2016). Towards an improved understanding of project stakeholder landscapes. *Journal of Project Management*, 34(8): 1537–1552. <https://doi.org/10.1016/j.ijproman.2016.08.009>
- ACCOMPLISSH, Guide to co-creation, 2018, <https://www.accomplish.eu/>
- Albert A., Balázs B., Butkevičienė E., Mayer K., Perelló J. (2021) Citizen Social Science: New and Established Approaches to Participation in Social Research. In: Vohland K. et al. (eds) *The Science of Citizen Science*. Springer, Cham. https://doi.org/10.1007/978-3-030-58278-4_7
- Altenhöner R, Blümel I, Boehm F, Bove J, Bicher K, Bracht C, Brand O, Dieckmann L, Effinger M, Hagener M, Hammes A, Heller L, Kailus A, Kohle H, Ludwig J, Münzmay A, Pittroff S, Razum M, Röwenstrunk D, Sack H, Simon H, Schmidt D, Schrader T, Walzel A-V, Wiermann B (2020) NFDI4Culture - Consortium for research data on material and immaterial cultural heritage. *Research Ideas and Outcomes* 6: e57036. <https://doi.org/10.3897/rio.6.e57036>
- Ånäs, S. (2020, December 14). Hack4OpenGLAM [Blog post]. <https://medium.com/open-glam/hack4openglam-6108b2f7be94>
- Auerbach, J., Barthelmess, E. L., Cavalier, D., Cooper, C. B., Fenyk, H., Haklay, M., Hulbert, J. M., Kyba, C. C. M., Larson, L. R., Lewandowski, E., & Shanley, L. (2019). The problem with delineating narrow criteria for citizen science. *Proceedings of the National Academy of Sciences*, 116(31), 15336–15337. <https://doi.org/10.1073/pnas.1909278116>
- Australian Citizen Science Association (2018). 10 Principles of Citizen Science. Retrieved from <https://citizenscience.org.au/wp-content/uploads/2018/09/10-Principles-of-Citizen-Science.pdf>
- Bonney, R., Ballard, H., Jordan, R., McCallie, E., Phillips, T., Shirk, J., and Wilderman, C. C. (2009). Public Participation in Scientific Research: Defining the Field and Assessing Its Potential for Informal Science Education. A CAISE Inquiry Group Report. Center for Advancement of Informal Science Education (CAISE). <https://files.eric.ed.gov/fulltext/ED519688.pdf>
- Bonney et al. (2013). Citizen science. *Encyclopedia of Science Education*. https://doi.org/10.1007/978-94-007-6165-0_291-1
- Borck, L. (n.d.). Open GLAM now! [Blog post]. <https://www.raa.se/in-english/events-seminars-and-cultural-experiences/open-digital-heritage/open-glam-now/>
- Bowser A., Brenton P., Stevenson R., Newman G., Schade S., Bastin L., Parker A. and Oliver, J. (2017). “Citizen Science Association Data & Metadata Working Group: Report from CSA and Future Outlook. Workshop Report. Woodrow Wilson International Center for Scholars, Washington, DC. Retrieved from <https://www.wilsoncenter.org/article/citizen-science-association-data-metadata-working-group-report-csa-2017-and-future-outlook>
- Bryson, J. M., Patton, M.Q., & Bowman, R.A. (2011). Working with evaluation stakeholders: A rationale, step-wise approach and toolkit. *Evaluation and Program Planning*, 34(1), 1–12. <https://doi.org/10.1016/j.evalprogplan.2010.07.001>
- Burawoy, M. (2005). For public sociology. *American Sociological Review*, 70(1), 4–28. <https://doi.org/10.1177/000312240507000102>
- Cahill, C. (2007). Participatory data analysis. In S. Kindon, R. Pain, & M. Kesby (Eds.), *Participatory action research approaches and methods: Connecting people, participation and place* (pp. 181–187). London: Routledge.
- Carroll, S. R., Garba, I., Figueroa-Rodríguez, O. L., Holbrook, J., Lovett, R., Materechera, S., Parsons, M., Raseroka, K., Rodriguez-Lonebear, D, Rowe, R., Sara, R., Walker, J., Anderson, J., & Hudson, M. (2020). The CARE Principles for Indigenous Data Governance. *Data Science Journal*, 19(1), 43. <http://doi.org/10.5334/dsj-2020-043>
- Caso, R., Dore, G., & Arisi, M. (2021). D5.1 Report on the existing legal framework for Galleries and Museums in EU (Task: European legal framework for GLAM industries: from closure to Openness). ReCreating Europe. <https://doi.org/10.5281/zenodo.5070449>
- Ceccaroni, L., Bibby, J., Roger, E., Flemons, P., Michael, K., Fagan, L., & Oliver, J. L. (2019). Opportunities and Risks for Citizen Science in the Age of Artificial Intelligence. *Citizen Science: Theory and Practice*, 4(1), 29. DOI: <http://doi.org/10.5334/cstp.241>
- Citizen Science. (n.d.). CSA Ethics Working Group. <https://www.citizenscience.org/get-involved/working-groups/ethics-working-group/>
- Civic Epistemologies, <https://www.civic-epistemologies.eu/>

- CLARIN, <https://www.clarin.eu/>
- CoAct, <https://coactproject.eu/>
- Creative Commons. (n.d.). CC Open Culture Platform (former Open GLAM Platform). <https://network.creativecommons.org/cc-openculture-platform/>
- Creative Commons Open Culture Platform (former Open GLAM Platform). (2020). Call for Stories: Open GLAM in Underrepresented Communities. <https://network.creativecommons.org/call-for-stories-open-glam-in-underrepresented-communities/>
- De Pourcq, K., Ceccaroni, L. (2018, October 5). On the importance of data standards in citizen science. Blog of the Citizen Science COST action. Retrieved from <https://cs-eu.net/blog/importance-datastandards-citizen-science>
- Dobrev, M., & Azzopardi, D. (2014). Citizen science in the humanities: A promise for creativity. In G. A. Papadopoulos (Eds.), Proceedings of the 9th international conference on knowledge, information and creativity support systems. Limassol, Cyprus, November 6–8, 2014 (pp. 446–451). Nicosia: Cyprus Library. https://www.academia.edu/10309775/Citizen_science_in_the_Humanities_A_promise_for_creativity
- DITOs consortium. (2017). Citizen Science and Open Science: Synergies and Future Areas of Work. DITOs policy brief 3. Retrieved from https://ecsa.citizen-science.net/wp-content/uploads/2020/02/ditos-policybrief3-20180208-citizen_science_and_open_science_synergies_and_future_areas_of_work.pdf
- Dörler, D., & Heigl, F. (2019). Citizen Science in Austria. Mitteilungen der Vereinigung Österreichischer Bibliothekarinnen und Bibliothekare, 72(2), 317-327. <https://doi.org/10.31263/voebm.v72i2.2836>
- Durham, E., Baker, H., & Smith, M. (2014). The BiodivERsA: Stakeholder Engagement Handbook. Biodiversa. <http://www.biodiversa.org/702>
- ECSCA. (2019). DITOs Fact finding and review collection of CS guidelines and publications. Zenodo. <http://doi.org/10.5281/zenodo.3247823>
- Edmond, J., Papaki, E., Tóth-Czifra, E., Clotworthy, A., Terras, M., & Tonra, J. (2019). Citizen Science in the (Digital) Arts and Humanities. Edited by Vicky Garnett. PARTHENOS Training Suite. [Training module]. <https://campus.dariah.eu/resource/citizen-science-in-the-digital-arts-and-humanities>
- Eitzel, M.V., Cappadonna, J.L., Santos-Lang, C., Duerr, R. E., Virapongse, A., West, S. E., Kyba, C. C. M., Bowser, A., Cooper, C. B., Sforzi, A., Metcalfe, A. N., Harris, E. S., Thiel, M., Haklay, M., Ponciano, L., Roche, J., Ceccaroni, L., Shilling, F. M., Dörler, D., Heigl, F., Kiessling, T., Davis, B. Y. and Jiang, Q. (2017). Citizen Science Terminology Matters: Exploring Key Terms. Citizen Science: Theory and Practice, 2(1), p.1-20. <http://doi.org/10.5334/cstp.96>
- English, P. B., Richardson, M. J., & Garzón-Galvis, C. (2018). From Crowdsourcing to Extreme Citizen Science: Participatory Research for Environmental Health. Annual Review of Public Health, 39(1), 335-350. <https://doi.org/10.1146/annurev-publhealth-040617-013702>
- Erasmus+. (2019). Programme guide. Retrieved from https://ec.europa.eu/programmes/erasmusplus/resources/programme-guide_en
- Europeana. (2021). EuropeanaTech AI for GLAMs task force. AI in relation to GLAMs. <https://pro.europeana.eu/project/ai-in-relation-to-glams>
- Europeana. (2021). Recommendations on copyright and its role in the digital transformation of the cultural heritage sector. Retrieved from <https://pro.europeana.eu/post/recommendations-on-copyright-and-its-role-in-the-digital-transformation-of-the-cultural-heritage-sector>
- European Citizen Science Association (ECSCA). (2015, September). Ten principles of citizen science. Retrieved from <https://ecsa.citizen-science.net/engage-us/10-principles-citizen-science>
- European Commission. (2011a). Commission Recommendation on the digitisation and online accessibility of cultural material and digital preservation. CELEX: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32011H0711>
- European Commission, Directorate-General for Research and Innovation. (2011b). Green paper on a common strategic framework for EU research and innovation funding: analysis of public consultation. Publications Office. <https://data.europa.eu/doi/10.2777/58706>
- European Commission. (2016). Open Innovation, Open Science, Open to the World – a vision for Europe. Directorate-General for Research and Innovation. Retrieved from <https://ec.europa.eu/digital-singlemarket/en/news/open-innovation-open-science-open-world-vision-europe>
- European Commission. (2017a). LAB-FAB-APP: Investing in the European future we want: report of the independent High-Level Group on maximising the impact of EU research & innovation programmes. Retrieved from <https://op.europa.eu/en/publication-detail/-/publication/ffbe0115-6cfc-11e7-b2f2-01aa75ed71a1/language-en/format-PDF/source-77975731>
- European Commission. (2017b). Providing researchers with the skills and competencies they need to practise Open

Science. Open Science Skills Working Group Report. Retrieved from http://ec.europa.eu/research/openscience/pdf/os_skills_wgreport_final.pdf

European Commission. (2019). Ethics guidelines for trustworthy AI. <https://ec.europa.eu/digital-single-market/en/news/ethics-guidelines-trustworthy-ai>

European Commission. (2019). Open Science, factsheet, December 2019 Retrieved from https://ec.europa.eu/info/files/open-science_en

European Commission. (2021). Commission Recommendation on a common European data space for cultural heritage. Official Journal, L 401, 5-16. CELEX: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021H1970>

European Union. (2018). Participatory Governance of Cultural Heritage. [Report of the OMC (Open Method of Coordination)]. <https://op.europa.eu/en/publication-detail/-/publication/b8837a15-437c-11e8-a9f4-01aa75ed71a1>

European University Association. (2017). Towards Full Open Access in 2020: Aims and recommendations for university leaders and National Rectors' Conferences. Retrieved from <https://eua.eu/resources/publications/417:towards-full-open-access-in-2020.html>

Event Metrics. (n.d.). <https://eventmetrics.wmflabs.org/>

Faro Convention. (2005). Council of Europe Framework Convention on the Value of Cultural Heritage for Society. Explanatory Report. <https://www.coe.int/en/web/culture-and-heritage/faro-convention>

Figueiredo Nascimento, S., Cuccillato, E., Schade, S., Guimarães Pereira, A. (2016). Citizen Engagement in Science and Policy-Making, EUR 28328 EN. <https://doi.org/10.2788/40563>

Fischer, A., Dinnie, E., Ellis, R., Eastwood, A., Carter, A. and Welsh, G. (2021). Exploring the Potential of Citizen Social Science for Environmental and Sustainability Research: Experiences of and with Community-Based Researchers. *Citizen Science: Theory and Practice*, 6(1), p.17. DOI: <http://doi.org/10.5334/cstp.389>

FIT4RRI, <https://fit4rri.eu>

FOSTER. (nd). Retrieved from <https://www.fosteropenscience.eu/>

Franzen M., Kloetzer L., Ponti M., Trojan J., Vicens J. (2021). Machine Learning in Citizen Science: Promises and Implications. In Vohland K. et al. (Eds.), *The Science of Citizen Science*. Springer, Cham. https://doi.org/10.1007/978-3-030-58278-4_10

Fritz, S., See, L., Carlson, T., Haklay, M. (Muki), Oliver, J. L., Fraisl, D., Mondardini, R., Brocklehurst, M., Shanley, L. A., Schade, S., Wehn, U., Abrate, T., Anstee,

J., Arnold, S., Billot, M., Campbell, J., Espey, J., Gold, M., Hager, G., ... West, S. (2019). Citizen science and the United Nations Sustainable Development Goals. *Nature Sustainability*, 2(10), 922–930. Retrieved from <https://www.nature.com/articles/s41893-019-0390-3>

GLAM-WIKI. (2011). Description. <https://outreach.wikimedia.org/wiki/GLAM>

GLAM-WIKI. (2013). Evaluation. <https://outreach.wikimedia.org/wiki/GLAM/Evaluation>

Göbel, C. (2019). Open Participatory Research — Four Challenges for Opening Science Beyond Scientific Institutions. <https://doi.org/10.25815/kykn-de07>

Haklay, M. (2013). Citizen Science and Volunteered Geographic Information: Overview and Typology of Participation. In: Sui, D., Elwood, S., Goodchild, M. (eds) *Crowdsourcing Geographic Knowledge*. Springer, Dordrecht. https://doi.org/10.1007/978-94-007-4587-2_7

Haklay, M. (2015). Citizen science and policy: a European perspective. *Woodrow Wilson International Center for Scholars*.

Haklay, M., Motion, A., Balázs, B., Kieslinger, B., Greshake Tzovaras, B., Nold, C., Dörler, D., Fraisl, D., et al. (2020). ECSA's Characteristics of Citizen Science. ECSA European Citizen Science Association. [10.5281/zenodo.3758667](https://zenodo.org/record/3758667).

Haklay, M. (2021). Introduction to Citizen

Science and Scientific Crowdsourcing, online course, Dept. of Geography, UCL. <https://extendstore.ucl.ac.uk/product?catalog=UCLXICSSCJan17>

Haklay M., et al. (2021). Contours of citizen science: a vignette study. *Royal Society Open Science*, 8:202108. <https://doi.org/10.1098/rsos.202108>

Heidel, E. (2019). Call for stories: Open GLAM in underrepresented communities. <https://network.creativecommons.org/cc-openglam-platform/>

Heidel, E. & Wallace, A. (2020). Towards a Declaration on Open Access for Cultural Heritage. *Open GLAM*. Retrieved from <https://openglam.pubpub.org>

Heigl, F., Kieslinger B., Paul, K. T., Uhlik, J., & Dörler, D. (2019a, April 23). "Opinion: Toward an international definition of citizen science." *Proceedings of the National Academy of Sciences* 116(17), 8089-8092. <https://doi.org/10.1073/pnas.1903393116>

Heigl, F., Kieslinger, B., Paul, K. T., Uhlik, J., & Dörler, D. (2019b). Reply to Auerbach et al.: How our Opinion piece invites collaboration. *Proceedings of the National Academy of Sciences*, 116(31), 15338– 15338. <https://www.pnas.org/content/116/31/15338>

Heinisch B., Oswald K., Weißpflug M., Shuttleworth S., & Belknap, G. (2021). Citizen Humanities. In Vohland K. et al. (Eds.), *The Science of Citizen*

- Science. Springer, Cham. https://doi.org/10.1007/978-3-030-58278-4_6
- Herodotou, C., Sharples, M., Scanlon, E. (Eds.). (2018). *Citizen Inquiry. Synthesising Science and Inquiry Learning*. Routledge. <https://doi.org/10.4324/9781315458618>
- Hollander, H., Morselli, F., Uiterwaal, F., Admiraal, F., Trippel, T., & Di Giorgio, S. (2018). PARTHENOS Guidelines to FAIRify data management and make data reusable. Zenodo. <https://doi.org/10.5281/zenodo.2668479>
- Howe, J. (2006, January 6). The rise of crowdsourcing. *Wired magazine*, 14(6), 1-4. Retrieved from http://www.wired.com/wired/archive/14.06/crowds_pr.html
- Jennings, E., Dobрева-McPherson, M., & Devreni-Koutsouki, A. (2015). *Citizen Science and Digital Cultural Heritage: Potential for Wider Engagement with the General Public*. Conference: Workshop in “Cultural Heritage Communities: Technologies and Challenges” at Communities and Technologies 2015, Limerick, Ireland. <http://dx.doi.org/10.13140/RG.2.1.2845.3843>
- Kieslinger, B., Schäfer, T., Heigl, F., Dörler, D., Richter, A., & Bonn, A. (2017, September 20). The challenge of evaluation: An open framework for evaluating citizen science activities. <https://doi.org/10.31235/osf.io/enzc9>
- Leavy, P. (2018). Introduction to arts-based research. In: Leavy, P (ed.), *Handbook of Arts-Based Research*. New York: The Guilford Press, 3–21
- Lewis, J. (2012). 'How to implement free, prior, informed consent (FPIC). *Participatory Learning and Action*, 65, 175-8. London: IIED.
- Loss, S. R., Loss, S. S., Will, T., & Marra, P. P. (2015). Linking place-based citizen science with large-scale conservation research: a case study of bird-building collisions and the role of professional scientists. *Biological Conservation*, 184, 439-445.
- McCarthy, D., & Wallace, A. (2018). Survey of GLAM open access policy and practice. *Copyright Cortex*. <https://copyrightcortex.org/tools-resources/survey-of-glam-open-access-policy-practice>
- McTaggart, R. (1996). Issues for participatory action researchers. In O. Zuber-Skerritt (Ed.), *New directions in action research*. London: Falmer Press.
- NEWHORIZON, <https://newhorizon.eu>
- Nind, M. (2017). The practical wisdom of inclusive research. *Qualitative Research*, 17(3), 278–288. <https://doi.org/10.1177/1468794117708123>
- Nunn, C. (2022). The participatory arts-based research project as an exceptional sphere of belonging. *Qualitative Research*, 22(2), 251–268. <https://doi.org/10.1177/1468794120980971>
- ODC (Open Data Charter). (2015). *International Open Data Charter*. Retrieved from <https://opendatacharter.net/principles/>
- OpenAIRE. (nd). Retrieved from <https://www.openaire.eu/openaire-and-eosc>
- Open and Collaborative Science in Development Network (OCSDNet). (2017). *Open Science Manifesto. Towards an Inclusive Open Science for Social and Environmental Well-being*. Retrieved from <https://ocsdnet.org/manifesto/open-science-manifesto/>
- OpenGLAM. (n.d.). *OpenGLAM What*. Retrieved from <https://openglam.org/what/>
- Open Knowledge Foundation. (n.d.). *What is open?* Retrieved from <https://okfn.org/opendata/>
- Open Science Policy Platform (OSPP). (2018, April 22). *Recommendations*. Retrieved from https://ec.europa.eu/research/openscience/pdf/integrated_advice_opspp_recommendations.pdf#view=fit&pagemode=none
- OpenGLAM principles. (n.d.). *OpenGLAM working group*. Open Content Exchange Platform. <https://178.62.72.185/items/show/253>
- OPERAS, <https://www.operas-eu.org/>
- PARTHENOS, (n.d.). *Module*: <https://training.parthenos-project.eu/sample-page/citizen-science-in-the-digital-arts-and-humanities>
- Paulin, D., & Haythornthwaite, C. (2016). *Crowdsourcing the curriculum: Redefining e-learning practices through peer-generated approaches*. *The Information Society*, 32(2), 130-142. <https://doi.org/10.1080/01972243.2016.1130501>
- Prats Lopez, M. (2017). *Managing Citizen Science in the Humanities: The challenge of ensuring quality*. (19 ed.). ABRI. <https://research.vu.nl/en/publications/managing-citizen-science-in-the-humanities-the-challenge-of-ensur>
- Research Libraries UK (RLUK). (2020). *A manifesto for the digital shift in research libraries*. <https://www.rluk.ac.uk/digital-shift-manifesto/>
- Robinson, L., Cawthray, J.L., West, S. E., Bonn, A., & Ansine, J. (2018). *10 Principles of Citizen Science*. In Hecker, S., Haklay, M., Bowser, A., Makuch, Z., Vogel, J. & Bonn, A. (Eds), *Citizen Science: Innovation in Open Science, Society and Policy*. UCL Press, London. <https://doi.org/10.14324/111.9781787352339>
- RRI Tools (n.d.). *The RRI Toolkit: recommended resources for Ethics* [Blog post]. <https://rri-tools.eu/ethics>
- Sanz, F. S., Holocher-Ertl, T., Kieslinger, B., García, F. S., & Silva, C. G. (2014). *White Paper on Citizen Science for Europe*.

- Socientize Consortium. Retrieved from <https://digital-strategy.ec.europa.eu/en/news/project-socientize-announces-white-paper-citizen-science-their-final-conference>
- Sapelli (n.d.). <http://www.sapelli.org/>
- Scassa, T., & Chung, H. (2015). *Managing intellectual property rights in citizen science: A guide for researchers and citizen scientists*. Washington, DC: Woodrow Wilson International Center for Scholars. https://www.wilsoncenter.org/sites/default/files/media/documents/publication/managing_intellectual_property_rights_citizen_science_scassa_chung.pdf
- Schaefer T., Kieslinger B. (2019) *Citizen Science: Different Scopes of Citizens' Involvement in Research*. In: Carayannis E. (eds) *Encyclopedia of Creativity, Invention, Innovation and Entrepreneurship*. Springer, New York, NY. https://doi.org/10.1007/978-1-4614-6616-1_200034-1
- Schäfer, T. & Kieslinger, B. (2016). Supporting emerging forms of citizen science: A plea for diversity, creativity and social innovation. *Journal of Science Communication*, 15. <http://dx.doi.org/10.22323/2.15020402>
- Scheliga, K., Friesike, S., Puschmann, C., & Fecher, B. (2018). Setting up crowd science projects. *Public Understanding of Science*, 27(5), 515-534. <https://doi.org/10.1177/0963662516678514>
- Shanley, L.A., Hulbert, J., Auerbach, J., Haklay, M., et al. (2019b). *CitSciDefinitions*, v1.2. <https://doi.org/10.5281/zenodo.3552753>
- Shanley, L.A., Parker, A., Schade, S. and Bonn, A.. (2019a). Policy Perspectives on Citizen Science and Crowdsourcing. *Citizen Science: Theory and Practice*, 4(1), p.1-5. <http://doi.org/10.5334/cstp.293>
- Skarlatidou, A., Suškevičs, M., Göbel, C., Prūse, B., Tauginienė, L., Mascarenhas, A., Mazzonetto, M., Sheppard, A., Barrett, J., Haklay, M., Baruch, A., Moraitopoulou, E., Austen, K., Baiz, I., Berditchevskaia, A., Berényi, E., Hoyte, S., Kleijssen, L., Kragh, G., Legris, M., Mansilla-Sanchez, A., Nold, C., Vitos, M., & Wyszomirski, P. (2019). The Value of Stakeholder Mapping to Enhance Co-Creation in Citizen Science Initiatives. *Citizen Science: Theory and Practice*, 4(1), 24. <http://doi.org/10.5334/cstp.226>
- Strasser, B., Baudry, J., Mahr, D., Sanchez, G., & Tancoigne, E. (2019). "Citizen Science"? Rethinking Science and Public Participation. *Science & Technology Studies*, 32(2), 52-76. <https://doi.org/10.23987/sts.60425>
- Tableau software, <https://www.tableau.com/>
- Tauginienė L., Hummer P., Albert A., Cigarini A., & Vohland K. (2021). Ethical Challenges and Dynamic Informed Consent. In Vohland K. et al. (Eds), *The Science of Citizen Science*. Springer, Cham. https://doi.org/10.1007/978-3-030-58278-4_20
- Tauginienė, L., Butkevičienė, E., Vohland, K. et al. (2020). Citizen science in the social sciences and humanities: the power of interdisciplinarity. *Palgrave Commun* 6, 89 <https://doi.org/10.1057/s41599-020-0471-y>
- Tauvel-Mocquet, O. (2018). « Dans un programme d'open science, la stratégie événementielle est essentielle »: Interview with Olivier de Fresnoye, coordinator of the programme Epidemium, France. *Entreprendre & Innover*, 38(3), 64-68. <https://doi.org/10.3917/entin.038.0064>
- Teperek, M., Cruz, M. J., Verbakel, E., Böhmer, J. K., & Dunning, A. (2018, January 29). Data Stewardship – addressing disciplinary data management needs. <https://doi.org/10.17605/OSF.IO/MJK9T>
- Thomas, S., Scheller, D. & Schröder, S. (2021). Co-creation in citizen social science: the research forum as a methodological foundation for communication and participation. *Humanit Soc Sci Commun* 8, 244. <https://doi.org/10.1057/s41599-021-00902-x>
- Truyen, F. (2020). Digital Transformation, ICT and Cultural Heritage: let's rethink Open Access [Blog post]. <https://fredtruyen.com/2020/09/13/digital-transformation-ict-and-cultural-heritage-lets-rethink-open-access>
- Turbé, A., Barba, J., Pelacho, M., Mugdal, S., Robinson, L.D., Serrano-Sanz, F., Sanz, F., Tsinaraki, C., Rubio, J.-M. & Schade, S., (2019). Understanding the Citizen Science Landscape for European Environmental Policy: An Assessment and Recommendations. *Citizen Science: Theory and Practice*, 4(1), p.1-16. <http://doi.org/10.5334/cstp.239>
- Tweddle, J. C., Robinson, L. D., Pocock, M. J. O. & Roy, H. E. (2012). Guide to citizen science: developing, implementing and evaluating citizen science to study biodiversity and the environment in the UK. Natural History Museum and NERC Centre for Ecology & Hydrology for UK-EOF. Retrieved from <http://www.ukeof.org.uk/documents/guide-to-citizen-science/view>
- UCL ECSAnVis Project. (n.d.). Extreme Citizen Science. <https://www.ucl.ac.uk/geography/ECSAnVis/en/#>
- UNESCO. (2003). Convention for the Safeguarding of the Intangible Cultural Heritage. Retrieved from <https://unesdoc.unesco.org/ark:/48223/pf0000132540>
- UNESCO Institute for Statistics. (2012). Measuring cultural participation. Retrieved from <https://unesdoc.unesco.org/ark:/48223/pf0000219213>
- Vélot, C. (2016). Scientists and civil society must move together toward a new science. *Frontiers in public health*, 4, 96. Retrieved

from <https://www.frontiersin.org/articles/10.3389/fpubh.2016.00096/full>

Vohland, K., Göbel, C. (2017). Open Science und Citizen Science als symbiotische Beziehung? Eine Gegenüberstellung von Konzepten. TATuP – Zeitschrift für Technikfolgenabschätzung in Theorie und Praxis 26 (1/2) 18-24. Retrieved from <https://www.tatup.de/index.php/tatup/article/view/21>

Ward M. O., Grinstein G. & Keim D. (2010). Interactive data visualization: foundations, techniques, and applications. AK Peters/CRC Press.

Wilkinson, M., Dumontier, M., Aalbersberg, I. et al. (2016). The FAIR Guiding Principles for scientific data management and stewardship. Sci Data 3, 160018 <https://doi.org/10.1038/sdata.2016.18>

YouCount - Youth Citizen Science, <https://www.youcountproject.eu/>

Zourou, K. & Potolia, A. (2021). Openness in a Crowd sourced Massive Online Language Community. In C. Blyth & J. Thoms (Ed.), Open Education and Second Language Learning and Teaching: The Rise of a New Knowledge Ecology (pp. 87-106). Bristol, Blue Ridge Summit: Multilingual Matters. <https://doi.org/10.21832/9781800411005-006>

Zourou, K. (2020). Academia permeating society through Citizen Science: use cases of engagement in Higher

Education. INOS consortium. Accessible at <https://inos-project.eu/>

Zourou, K. (2021). Some examples of digital action inside and beyond universities during the pandemic. HEIDI consortium. Accessible at <https://heidiproject.eu/wp-content/uploads/2021/09/HEIDI-O1A1-final-version.pdf>

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