

Participation in research through new digital media makes it possible to 'transcend the divide between experiential knowledge, formal science and socio-political decision-making'.

Chiara Certomà and Michel Pimbert

CO-PRODUCING KNOWLEDGE ONLINE

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Chiara Bonacchi



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Contents

Connected Communities Foundation Series	4
About the author	9
1. Introduction	10
1.1 Online collaborations beyond the academy	11
1.2 Scope and aim of this review	11
1.3 Context	12
2. An overview of 'traditions'	13
2.1 Citizen science	13
2.2 Public and digital humanities	14
2.3 Hacker communities	14
2.4 Open innovation and crowdsourcing	15
3. Concepts and models	16
3.1 What do 'new' digital media do to research?	16
3.2 Models	17
3.3 Web infrastructures	19
4. Participants and motivations	20
4.1 Why are people taking part?	20
4.2 Who is participating?	21
5. Contemporary debates	22
5.1 Power and vulnerability	22
5.2 Epistemologies	24
6. Case study 1: MicroPasts	26
6.1 Who and why?	26
6.2 How it happened	28
6.3 Outcomes	30
7. Case study 2: TrowelBlazers	32
7.1 Who and why?	32
7.2 How it happened	32
7.3 Outcomes	34
8. Reflections and conclusion	35
References	38
Glossary	42
Also in this series	44

CONNECTED COMMUNITIES Foundation Series

Today we are increasingly seeing calls for universities to collaborate with communities in designing and conducting research. While such calls are to be welcomed they tend to suffer from a historical blind-spot that ignores the fact that research collaboration – partnerships, participation (call it what you will) – is a deep and powerful research tradition that dates back beyond the recent emergence of calls for ‘co-produced’ knowledge.

This series of reviews developed as part of the AHRC’s Connected Communities Programme, sets out to make visible some of these traditions of collaborative research. In doing so, the series aims to:

- help those who are new to the field to understand the huge wealth of history and resources that they might draw upon when beginning their own research collaborations;
- help those who seek to fund and promote collaborative research to understand the philosophical and political underpinnings of different traditions; and
- support those working in these traditions to identify points of commonality and difference in their methods and philosophies as a basis for strengthening the practice of collaborative research as a whole.

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Research collaboration is a deep and powerful research tradition that dates back beyond the recent emergence of calls for ‘co-produced’ knowledge.

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The eight reviews in the series were developed to provide eight very different ‘takes’ on the histories of collaborative research practices in the arts, humanities and social sciences. They do not pretend to be exhaustive, but to provide a personal perspective from the authors on the traditions that they are working within. As we worked together as a group to develop these, however, a number of commonalities emerged:

1. A critique of the mission-creep of scientific knowledge practices into the social sciences and humanities, and of the claims to produce universally valid forms of knowledge from specific limited institutional, cultural and social positions.
2. A commitment to creating research practices that enable diverse experiences of life and diverse knowledge traditions to be voiced and heard.
3. A resistance to seeing research methods as simply a technocratic matter; recognising instead that choices about how, where and with whom knowledge is created presuppose particular theories of reality, of power and of knowledge.
4. A commitment to grapple with questions of power, expertise and quality and to resist the idea that ‘anything goes’ in collaborative research and practice. There are better and worse ways of developing participation in research practice, there are conditions and constraints that make collaboration at times unethical.

At the same time, a set of names and events recur throughout the reviews: John Dewey, Paolo Freire, Raymond Williams, Donna Haraway appear as theorists and practitioners who provide powerful philosophical resources for thinking with. Critical incidents and moments reappear across the reviews: the rise of anti-colonial movements in the 1950s and 1960s, of second wave feminism and critical race theory in the 1960s and 1970s; of disability rights movements in the 1970s and 1980s; of post-human and ecological analyses in the 1990s and 2000s. Read as a whole, these reviews demonstrate the intellectual coherence and vibrancy of these many-threaded and interwoven histories of engaged scholarship and scholarly social action.

The first of the reviews, by **Kevin Myers** and **Ian Grosvenor**, discusses the long tradition of ‘history from below’ as a collaborative enterprise between researchers, archivists, curators, teachers, enthusiasts, local historians, archaeologists and researchers. They discuss the emergence of the ‘professional historian’ alongside the rise of the nation state, and the way in which this idea was challenged and deepened by the emergence of activist histories in the mid-20th century. They investigate the precedents set by the rise of groups such as the History Workshop movement and trace their legacies through a set of case studies that explore feminist histories of Birmingham, disabled people’s histories of the First World War and the critique of white histories of conflict emerging from the work of black historians and communities.

Two of the reviews explore currents within participatory and critical research traditions. Niamh Moore explores these traditions through the lens of feminist philosophies and methodologies, while Tom Wakeford and Javier Sanchez Rodriguez explore the history of participatory action research (PAR) and its ties to social movements outside the academy.

Niamh Moore's review highlights the strategic contributions made to participatory research through the traditions of feminist and indigenous methodologies. Drawing on Donna Haraway's metaphor of the cat's cradle, Moore explores the way that these different traditions have learned from each other, fed into each other and been in (productive) tensions over the years. Importantly, she makes visible the common threads of these traditions, including a concern with questions of power, matters of voice, agency and empowerment and reflexivity. She identifies examples that include: popular epidemiology and women's health; the controversies and emerging insights arising from the publication of the book 'I Rigoberta Menchú' (a collaboration between Rigoberta Menchú, a Guatemalan activist and Peace Prize winner and anthropologist Elisabeth Burgos-Debray); and the online Mukurtu platform for sharing and curating community stories.

Wakeford and Sanchez Rodriguez's review is written from the position of individuals who situate themselves as both activists and academics. From a perspective both inside and outside the academy, they make visible the traditions of participatory action research that have evolved in social movements and their interaction with academic knowledge. They explain how PAR emerged as a practice that seeks to intervene and act on the world through disrupting assumptions about who has knowledge, and by building intercultural dialogue between those whose interests have historically been marginalised and those experts and institutions in dominant positions. They discuss the contributions of Paolo Freire and Orlando Fals Borda, as well as the emergence within universities of centres for Action Research and indigenist approaches to research before exploring recent examples of PAR from the Highlander Folk School in the US, to the Cumbrian Hill Farmers post Chernobyl, to questions of Food Sovereignty in India (amongst others).

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Central to many attempts to build collaborative research practices is a turn towards the arts and arts methodologies as a means of engaging with different forms of knowledge. Such a turn, however, can often overlook the distinctive and sustained tradition within contemporary arts of reflecting upon the question of how publics can come to participate in arts practices. Our series therefore includes two reflections on this question from different perspectives:

First, **Anne Douglas'** review offers a 'poetics of participation in contemporary arts', locating the turn to participation in contemporary arts within a wider history of 20th and 21st century arts and politics. She highlights the huge range of work by artists and arts co-operatives who are seeking to make work through participatory forms, and the deep scholarly tensions and debates that surround these practices. She explores through this rich history the debates over whether participation has become instrumentalised; whether the art/life divide should be preserved or eroded; the links between participatory aesthetics and cybernetic ethics; and the capacity for participation to challenge alienation and neoliberalism. Recognising arts practice as itself a form of research and inquiry into the world, she concludes with a set of powerful reflections on the role of the freedom to improvise and the importance of participation as a moment of care for and empathy with the other.

Second, **Steve Pool**, community artist and academic, reflects on the related but different traditions of community arts as they might relate to social science research. He considers what researchers in the social sciences might need to know and understand about artistic traditions if they desire to mobilise arts practice within the social sciences. He discusses the increasing democratisation of tools for making, the potential for them to open up artistic practice to publics as well as the importance of recognising that such practices are part of wider traditions and philosophies about the value and purpose of art. In particular, he discusses the tension between the idea of artistic autonomy – art for art's sake – and artistic democracy – the democratic creativity of all individuals. He foregrounds the way in which the community arts movement was also allied to a wider politics that moved towards cultural democracy and explores the contemporary practice of artists working in and with social science through examples such as Nicola Atkinson's 'Odd Numbers' and the Community Arts Zone's 'Being Cindy Sherman'.

More recent traditions of collaborative research characterise our final three reviews which take on, respectively, the way that design theory and practice are playing an important role in reshaping society, products and services; the emergence of new technologies to facilitate new forms of collaboration; and the increasingly urgent injunction to develop research approaches that enable collaboration with the 'more-than-human' others with whom we share the planet.

Theodore Zamenopoulos and **Katerina Alexiou** discuss the field of co-design and its underpinning theories and methods. They argue that Design as a process is always concerned with addressing a challenge or opportunity to create a better future reality, and explore how co-design has evolved as a process of ensuring that those with the life experiences, expertise and knowledge are actively involved in these making new tools, products and services. They observe how the participatory turn in this field has been concerned with both changing the objects of design – whether this is services or objects – *and* with the changing processes of designing itself. They highlight four major traditions and their distinctive approaches, before exploring the politics and practices of co-design through case studies of work.

Chiara Bonacchi explores how the internet is enabling new forms of collaborative knowledge production at a massive scale. She locates this discussion in the traditions of citizen science and public humanities, and examines how these have been reshaped through the development of hacker communities, open innovation and crowd-sourcing. In this process, she discusses the new exclusions and opportunities that are emerging through the development of projects that mobilise mass contribution. She examines the cases of MicroPasts and TrowelBlazers that demonstrate how these methods are being used in the humanities. In particular, she explores the ethical questions that emerge in these online collaborative spaces and the need for a values-based approach to their design.

Tehseen Noorani and **Julian Brigstocke** conclude the series with an exploration of the practice and philosophy of ‘more-than-human research’ which seeks to build collaborative research with non-human/more-than-human others. They discuss its philosophical foundations in pragmatism, ecofeminism and indigenous knowledge traditions and identify some of the theoretical and practical challenges that are raised when researchers from humanist traditions begin to explore how to ‘give voice’ to non-human others. In the review, they consider how researchers might expand their ‘repertoires of listening’ and address the ethical challenges of such research. To ground their analysis, they discuss the work of the Listening to Voices Project as well as accounts of researcher-animal partnerships and projects that draw on Mayan cosmology as a means of working with sustainable forestry in Guatemala.

This collection of reviews is far from exhaustive. There are other histories of collaborative research that are under-written here – there is much more to be said (as we discuss elsewhere) on the relationship between race and the academic production of knowledge. Each of these accounts is also personal, navigating a distinctive voiced route through the particular history they are narrating.

Despite this, at a time when politics is polarising into a binary choice between ‘expert knowledge’ and ‘populism’, these reviews show, collectively, that another way is possible. They demonstrate that sustained collaborative research partnerships between publics, community researchers, civil society, universities and artists are not only possible, but that they can and do produce knowledge, experiences and insights that are both intellectually robust and socially powerful.

Professor Keri Facer
Dr Katherine Dunleavy

Joint Editors: Connected Communities Foundation Series

ABOUT THE AUTHOR

Chiara Bonacchi

Chiara Bonacchi has recently joined the University of Stirling as a Lecturer in Heritage, in the Division of History and Politics. She was previously Research Co-Investigator at the UCL Institute of Archaeology, where she was co-leading the AHRC-funded project *Ancient Identities in Modern Britain* (ancientidentities.org). After a BA in Archaeology and an MA in Medieval Archaeology at the University of Florence, she completed a PhD from the UCL Institute of Archaeology. Her research focuses on the public perceptions, experiences and uses of the past in contemporary society, on digital methods for heritage research and public engagement, including co-production, and on medieval archaeology. She is co-founder of the award-winning *MicroPasts* project for the crowdsourcing of open data in archaeology, history and heritage (micropasts.org), and of the *Digital Heritage Data Initiative*. Since 2008, Chiara has also been collaborating with Italian universities to establish Public Archaeology as a field of research and teaching in Italy, and advising arts and culture funding bodies and organisations internationally.

1. INTRODUCTION

Knowledge production today relies increasingly on exchanges between groups of people who connect through the Internet. This can happen in many forms that include, for example, consulting and amending Wikipedia entries, engaging in Twitter conversations about a certain topic, or developing research software by building on existing code released under a license that allows free sharing, modification and reuse.

Other kinds of *collaborative research* are enabled by more bespoke websites built for specific institutions or groups, such as the *Smithsonian Transcription Centre*, which was created to involve interested *volunpeers* (volunteers who are viewed as peers) in the digitisation of collections that support multiple research agendas. The British Library has also recently embraced a similar goal, setting up the *LibCrowds* platform, while adventure seekers can connect to *GlobalXplorer* and inspect satellite images to identify signs of looting and assist with understanding the current state of preservation of archaeology-rich landscapes worldwide. For nature lovers, *Snapshot Serengeti* offers the possibility to ‘observe animals in the wild’ and help to answer questions about the ways in which competing species coexist.

All of these processes have become possible thanks to the wide diffusion of the Internet, and the emergence of online public spaces from an interactive and interconnected World Wide Web. This kind of web has enabled new practices of data and information generation, sharing and aggregation, but, arguably, the collaborative production (and consumption) of knowledge is sometimes so deeply embedded in our personal and professional lives that we do not always pause to reflect on its nature and deeper implications.¹ The aim of this review is to bring attention to these issues by addressing a number of questions relating to online research collaborations established between stakeholders within and beyond the academy. How can collaborative research be strategically and effectively designed online? What are its roots and traditions? What values can it generate for participants? What effects does it have on those excluded? And what are its consequences in *epistemological* and ethical terms?

¹ Facer 2011; Bonacchi 2017a; Hacklay 2018.

² Bonacchi 2012b: xv.

³ Postman 1970.

⁴ Lister et al. 2009.

⁵ boyd and Ellison 2007; de Zúñiga et al. 2017: 45.

⁶ Kreps and Kimppa 2015.

1.1 Online collaborations beyond the academy

In the following pages, I will discuss how new digital media are transforming research by supercharging opportunities for collaboration between people who received formal training in a specific field and others who did not. The term *new media* refers to transformations in media production, distribution and use that follow the invention and widespread diffusion of new technologies.² It describes those adaptations that occur in the media environment whenever a new event occurs and alters the pre-existing equilibrium.³ Even though, in the last few years, the label *new media* has probably been used less than in the first decade of the 21st century, it retains an important ability to highlight the processes underlying media change and, as such, I believe it is still very helpful.

Despite being introduced in the 1960s, the term *new media* now relates to communications that are increasingly digital, interactive, hypertextual, virtual, networked, simulated, ubiquitous and delocated.⁴ Amongst other things, these communications unlock new forms of representation, new relationships between identity and community, and new practices of producing and organising information. All these changes became more dramatic and fast-moving when the web started to be a place where citizens could have ‘public or semi-public profiles, articulate social connections with other profiles, and navigate these connections over virtual space’.⁵ At the same time, the Semantic Web, machine readable web, and the advent of the Internet of Things have added another layer of multi-device and object interactions that no longer need browsers and search engines.⁶

Clearly, this substantial reconfiguration of the world of media and communication has had a significant impact on the creation of knowledge. To understand how this has occurred, it is important to maintain a critically aware position that remains distant from both (digital) utopia and dystopia, in a real attempt to identify the opportunities that are open for online collaborative research today, but also the limitations and threats that still exist.

1.2 Scope and aim of this review

This review aims to be a tool for those who are approaching online collaborative research without necessarily having prior experience in the area – from students to researchers, practitioners and other interested members of our society. It will:

- **Section 2:** provide an overview of some of the main paths that have led to the development of this approach.
- **Section 3:** introduce conceptual foundations and models of application.
- **Section 4:** review participants and their motivations for being involved.
- **Section 5:** discuss contemporary challenges and debates.
- **Sections 6–7:** explore two specific case studies, to help readers navigate practical aspects and implications of establishing collaborative research initiatives online.

In the last two sections, I will present a project on which I have been collaborating for over four years, *MicroPasts*, and one that I have close access to, *TrowelBlazers*, in order to offer behind-the-scenes insights and considerations. In so doing, I will inevitably bring to this work my personal research focus on public archaeology and heritage. Moreover, it should be noted that the review draws primarily on UK-based (albeit international in scope) case studies and on Anglophone literature. This bias derives mainly from my current professional affiliation and experience, and – in smaller part – from the geography of Internet availability and use, and the policy and funding context that has pushed ‘networked’ research programmes (see 1.3. Context).

1.3 Context

In the second half of the 1900s, the worlds of arts and culture and of higher education in the UK experienced a ‘participatory turn’, and collaborative approaches have been encouraged even more prominently in the past few decades, under Labour, Coalition (2010 – 2015) and subsequent Conservative governments.⁷ These agendas have been running in parallel with the emergence of post-92 universities – created from the re-designation of institutions such as polytechnics – and with the introduction of the Research Excellence Framework.⁸ This framework has placed a particular stress on the need for universities to prove impact, not only from a scientific point of view but also in social terms, articulating how the research that is undertaken actually affects society at different levels. Undoubtedly, such developments have led academics to open up to the public more than in the past, and the online scene has provided *loci* for this to happen.

In this context, for example, the UK Arts and Humanities Research Council has recently made available funding that targets digitally-enabled collaborative research through the *Digital Transformations* and *Connected Communities* schemes, the hybrid call on *Digital Transformations in Community Research Co-Production in the Arts and Humanities*, and the *Joint Programming Initiative in Cultural Heritage – Digital Heritage*, to name just some of the main initiatives. I will return to the funding landscape in the last part of this review to highlight what I feel might have been benefits and challenges to present.

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⁷ Doeser 2015.

⁸ Bonacchi and Willocks 2016.

2. AN OVERVIEW OF ‘TRADITIONS’

There are at least four main paths that have led to the development of online collaborative research: 2.1. citizen science, 2.2. public and digital humanities, 2.3. hacker communities, and 2.4. crowdsourcing and open innovation. In presenting each of them, I will stress how they often intersect and reference each other.

2.1 Citizen science

A large strand of Internet-enabled collaborative research is rooted in *citizen science*, a term that entered common use in 1989.⁹ Even though scientists have been engaging volunteers for a very long period, it is from the 1950s that they started to involve them more systematically in their research. In 1957, citizen scientists took part in the first extensive satellite tracking initiative and, throughout the 1960s and 1970s, they participated in various observation exercises, looking at phenomena ranging from weather conditions to – again – satellite movement.

As a result of the emergence of new digital media, citizen science has grown and changed. Today, people have the possibility to connect through peer-communications, and the technology allowing this (from smartphones to tablets) is becoming progressively cheaper and more widely and readily available. At the same time, a larger group of individuals within advanced economies has seen their leisure time expanding, either as a consequence of their retirement or because of the affirmation of a two-day weekend culture, especially amongst skilled professionals in more secure positions.¹⁰ In these same countries, the number of those with university level education has raised substantially, and this cohort now has more time to join collective processes of knowledge creation.

In this situation, people can potentially help to collect a deluge of data in forms that can be easily aggregated and processed.¹¹ The first large-scale programme of online citizen science was Galaxy Zoo, a project inviting citizens’ help to classify galaxies based on images provided to them via the Zooniverse platform. It is also important to note that, in their first published article, the team of astrophysicists leading Galaxy Zoo referred to the work of ca. 100,000 contributors who (at that time) had been assessing the morphology of galaxies as *crowdsourcing*.¹² This is a term that describes both a tradition of outsourcing labour from the business world and a specific type of Internet-enabled group collaboration, as I will discuss in sections 2.4. Open innovation and crowdsourcing and 3.2. Models.

⁹ Haklay et al 2018.

¹⁰ Haklay et al 2018.

¹¹ For an example in archaeology see Bevan 2015.

¹² Lintott et al 2008.

2.2 Public and digital humanities

The rise in popularity of computational approaches in the humanities has led to growing collaborations with computer scientists and hackers, particularly in areas concerned with the development of software and the use of the Internet in order to create distributed knowledge. This 'computational turn', however, initially concentrated on designing solutions to facilitate research within the academy rather than in cooperation with citizens, and the trend has shifted only more recently.

In geography, for example, the Volunteered Geographic Information movement has been inviting citizens to collect and disseminate geographic information, as in the case of the *Wikimapia* or the *OpenStreetMap* projects.¹³ Similarly, in archaeology and history, greater attention has been devoted to new digital media for purposes of public engagement with research.¹⁴ This has often happened within the grounds of public archaeology and public history, which formally began to take shape in the 1970s and, since then, have been committed to examining the relationship between archaeology and history, on the one hand, and society, on the other, with the aim of improving this relationship.¹⁵ A similar transition has characterised the digital humanities, which have moved from dealing primarily with issues of digitisation and Internet applications for analytical purposes, to investigating aspects relating to outward-looking collaborative research, especially under the umbrella label of 'crowdsourcing'.¹⁶ Finally, digital heritage is also emerging, concerned with studying the role of digital technologies in processes of appropriation of the past in the present, by applying critical and social theory.

It is generally acknowledged that the humanities started later than the sciences to use the web extensively in order to build collaborations outside the academy.¹⁷ A possible reason for this might be that science disciplines are more exposed to the challenges of 'big data', and thus prone to welcome the involvement of citizens in order to speed-up research tasks that would otherwise be extremely lengthy or altogether unachievable. A second factor could be the skill-set of science researchers, who are more frequently familiar with computational methods than their colleagues in the humanities.¹⁸ Hence, the need for serious efforts aimed at addressing this gap through focused training and education.

2.3 Hacker communities

This tradition is grounded in the field of electronic communication and computer science but has strong implications for all the other traditions I am considering here. The hacker culture originates from circles of academics based at the Massachusetts Institute of Technology who, in the 1960s, were mastering programming in new, transformative and playful ways. The movement was inspired by ideas of freedom and liberation, and by a postmodernist view of systems of knowledge production as fluid, rather than 'stable, material and physical'.¹⁹

This hacking culture developed into the Free Software Movement, founded in 1983, when Richard Stallman launched the General Public License (GNU) project and two years later created the Free Software Foundation, arguing in favour of the development of non-proprietary software. Thereafter, the Open Source Initiative was set up to stress the importance of open source software for the advantages it offered in terms of software development rather than free cost. Today, the term Free and

¹³ Goodchild 2007.

¹⁴ Bonacchi 2012a; Noiret 2013, 2015.

¹⁵ Matsuda and Okamura 2011; Gardner and Hamilton 2017.

¹⁶ Terras 2016.

¹⁷ Rockwell 2012.

¹⁸ Rockwell 2012.

¹⁹ Douglas 2002: xvii.

Open Source Software (FOSS) has become the most frequently used as a compromise between the two labels mentioned above and their respective underlying motivations and ideologies.

During the 1960s and 1970s, hacking groups were primarily based in universities because computers were not widespread amongst the population, and accessible only by an elite. The movement that had come together to advocate for freedom had, in fact, created some of the preconditions for establishing proprietary rights and a 'closed' society; FOSS started to be used to contrast this trend, as a means of achieving an 'open society'.²⁰

Collaborative coding is now situated in the wider context of philosophies promoting 'the open redistribution and access to [...] data, processes and syntheses generated'.²¹ As such, it has become part of virtually any field, for example nurturing the growth of online citizen science, of computational archaeology and history, and the later development of digital public archaeology, digital public history, digital heritage, and the digital humanities.

2.4 Open innovation and crowdsourcing

This last section touches upon two interlinked traditions that belong to the world of business and management. Crowdsourcing is a term that was coined by Jeff Howe to describe the practice of outsourcing labour in sizeable bits amongst large groups of people, or crowds, who complete individually small tasks online in exchange for monetary rewards.²² A famous example is the *Amazon Mechanical Turk*, a platform developed by Amazon as a marketplace for, amongst others, editorial jobs such as the transcription or correction of texts.

In more recent years, however, the platform has also been hosting research support activities, particularly helping social scientists to recruit participants in surveys, experiments or observations.²³ In contrast to the social sciences, the sciences and humanities have usually preferred to opt for types of online citizen involvement that do not entail paid labour. There are a number of reasons for this, including a (claimed) desire to support intrinsically motivated participants and the fact that the latter are not the subjects of inquiry in these studies, hence they do not need to be representative of a specific population – I will return to some of these ideas in Section 4.

When contributions are not mechanical tasks but more complex processes, crowdsourcing may lead to *open innovation*, where a company is committed to generating ideas that might bring along improvements of product or process. This aim is achieved by seeking innovation both inside and outside the organisation, and pursuing 'internal and external paths to market'.²⁴ Thus, open innovation practices often entail synergies between smaller and bigger companies, research institutions and hacker groups. An example is that of Lego, who, in the early 2000s, overcame a crisis resulting from, amongst other things, broader changes in the toy and gaming industry. After issuing an open call for contributions, the company started to implement community-generated designs, developed through interactions taking place online, thanks to forum technology, and voting and vetting procedures.²⁵ When a model was produced, Lego shared 1% of the revenues with the designers who created it, and, in this way, motivated them to take interest in both the commercial viability of their work and the success of sales.

²⁰ Lessig 1999.

²¹ Beck and Neylon 2012: 479–480.

²² Howe 2006.

²³ Bohannon 2011, Shank 2016.

²⁴ Brabham 2008: 243; Markman 2016, Chesbrough 2006.

²⁵ Schlagwein and Bjørn-Andersen 2014.

3. CONCEPTS AND MODELS

3.1 What do 'new' digital media do to research?

Having briefly introduced some of the main paths that have led to distributed knowledge production over the Internet, I will now move to examine three intersecting characters that define the transformations brought about by online collaborative research.

1. Accelerated aggregation

Through the Internet, we can connect people and machines to supercharge the computational and human power that supports processes of knowledge production faster than ever before. We can rely on distributed storage and **cloud computing** for big data analysis, as well as on the creation of networks of citizens working towards the solution of ambitious and shared, large-scale research problems. Additionally, modular data structures allow aggregating data objects more easily and in ways that can be modified over time. This facilitates the reproducibility and accountability of research, while potentially unlocking novel opportunities for answering questions that could not be addressed before due to limited availability of resources.

2. Relative proximity

As effectively summarised by Christine Hine, the use of the Internet is embedded, everyday and embodied, and many of the activities that we perform as part of our lives unfold across online and offline spaces.²⁶ Undoubtedly, the rise of the collaborative web, with social media and a plethora of messaging services, has somehow contributed to the transformation of previously more 'all-encompassing and self-controlling' communities and the emergence of more individualised and fragmented ones.²⁷ The latter are shaped by the person and can include people located at different physical distance from each other, but having relative proximity on the basis of common interest. Haythornthwaite and Wellman called this phenomenon **networked individualism**.²⁸

²⁶ Hine 2015.

²⁷ Haythornthwaite and Wellman 2002.

²⁸ Haythornthwaite and Wellman 2002.

Online collaborative research can play an important role as a means, for some citizens, and those in lower age groups especially, of confronting themselves with the construction of their own identities.

²⁹ Habermas 1962.

³⁰ Kemmis et al. 2014.

³¹ Facer 2011.

³² Fiske 1991.

³³ Bevan 2012.

3. Online public spheres

Jürgen Habermas' idea of the **public sphere** has become a macro-concept, widely leveraged across disciplines and areas of research for decades.²⁹ There is not, however, one monolithic public sphere and, when applied to today's online reality, the concept 'explodes' into different communicative web spaces that host participatory culture and are used primarily by young people, who are instead distancing themselves from offline public spaces.³⁰ Online collaborative research can then play an important role as a means for some citizens, and those in lower age groups especially, of confronting themselves with the construction of their own identities, learning what it means to be part of a community and to contribute to shape its values and norms.³¹ Yet, the idea of **online public spheres** is somehow in tension with that of **accelerated aggregation**: the first tends to maximise efficiency in research through high-speed, high-quality and high-performance practice, whereas the second requires embracing a slower pace to ensure inclusivity and debate. The challenge of ethical online collaborative research is to ensure balance and dialogue between these two components.

3.2 Models

Different traditions have developed a range of models to describe collaborative research, however, none of these looks at online collaborations specifically and with the aim of distilling types that are cross-disciplinary. Here, I suggest that Internet-enabled and collective knowledge production can be differently built depending on how four key elements are constructed.

1. Human relationships

Drawing on social anthropology literature,³² Andrew Bevan suggests thinking of online groups as possibly underlying one or more of the following: undifferentiated relationships of inclusion or exclusion (**communal sharing**), ordered relationships of unequal status (**authority ranking**), peer-to-peer (**equality matching**), or metrical relationships (**market pricing**).³³ Along these lines, we can then think of the Amazon Mechanical Turk as a platform that is largely based on market pricing, as sums of money are paid to contributors depending on the kind of help they provide. Differently, Zooniverse relies mainly, but not exclusively, on authority ranking, since citizen scientists are invited to classify galaxies following rules that, to a large extent, have been pre-set by researchers.

2. Internet-enabled groups

Human relationships can link people into two possible kinds of Internet-enabled groups. If the group is composed of individuals who are connected by weak ties and share a common purpose, towards which they work through relationships of authority ranking, we have **crowdsourcing**. The group is, instead, a **virtual community**, when people are linked by strong ties, have built shared values and norms, and peer-to-peer relations prevail.



Figure 1
Agendas that can be shared
by Internet-enabled groups.

3. Agendas

Both of the Internet-enabled groups mentioned above have common agendas that can entail: the generation of new, 'born digital' data that did not exist in analogue form; the digitisation and transformation of existing (analogue) data; data analysis and interpretation; or even the scoping and establishment of new research agendas. Depending on the goals that are adopted by an online collaborative research initiative, more or less skills and knowledge are required of participants (Figure 1).³⁴

4. (Un)intended collaborations

Finally, collaborations can be *intentional* or *unintended*. More interconnected web infrastructures have led to the emergence of so-called web archives, where information that is publicly shared and can be utilised for research regardless of the original reason for which it was generated. When this happens, researchers are 'partnering' with unaware citizens who enable research efforts they might never know the existence of.

³⁴
Simon 2010.

3.3 Web infrastructures

My decision to have this section follow from the discussion of collaboration models has the specific aim to stress the importance of social dynamics in shaping online research beyond the academy. Web infrastructures supporting such collaborations can be of three main types, which are often used simultaneously and connected to each other.

1. Dedicated websites

Dedicated crowdsourcing sites can be standalone websites set up for a given initiative (e.g. the Megalithic Portal and Wikipedia), or thematic platforms hosting multiple projects (e.g. MicroPasts and Zooniverse).

2. Fora

Fora allow members to register and participate in discussions around certain topics that – sometimes – they are also free to propose. All of the three examples mentioned above – MicroPasts, Zooniverse and the Megalithic portal – have some form of forum linked to them.

3. Social Networks

Social networking sites, can be used for the purposes of enabling or supporting crowdsourcing kinds of groups or online communities.

The software that powers these infrastructures can either be proprietary or Free and Open Source (FOSS), as described in the section illustrating traditions for online research collaborations that relate to hacking cultures (Section 2.3). The adoption of FOSS has strong implications for practice, particularly in terms of sustainability and scalability. As noted previously, FOSS is the 'in progress result' of shared practices of coding. Its success relies on its sizeable nature, greater modularity and adaptability, and on being generated by a community who is also available for support via online interactions. On the whole, this can lower sustainability costs and limit the reliance on commercial providers, thus contributing to the longer-term life of online research collaborations.

▼
FOSS software can lower sustainability costs and limit the reliance on commercial providers, thus contributing to the longer-term life of online research collaborations.
▲

4. PARTICIPANTS AND MOTIVATIONS

4.1 Why are people taking part?

What is the place of Internet-enabled and collective knowledge production in people's everyday lives? Obtaining a monetary reward can be a motivating factor in those projects that implement crowdsourcing via commercial platforms like the Amazon Mechanical Turk. Other strong motivations are connectedness and membership, and sharing and generosity.³⁵ These two clusters are so important that their intensity directly correlates with the 'workload' that contributors complete.³⁶ Participants in crowdsourcing can, in fact, be divided in two macro-categories. There is a first and smaller group of so-called 'super-contributors', who undertake the majority of the work and are also likely to take part in deeper kinds of engagement than the contributory and micro-task based one; a second and much larger group is instead fleetingly involved and submit just a few tasks. This last group of 'transient participants' engage in *helping activity*, which is different from voluntarism because it is sporadic, rather than regular, and emerges as a response to an 'unexpected request to help someone to do something'.³⁷

In addition to social motivations, people can be led to take part in online collaborative research for reasons such as:³⁸

- Being interested in the research topic³⁹
- Being interested in the research methods employed
- Enjoying the research task
- Learning new information
- Contributing to original research
- Sharing the same goals and values as the project
- Receiving recognition and feedback
- The size of the challenge
- Amazement at the scale of the source assets
- Discovering resources for teaching
- Competition
- Autonomy
- Relaxation
- Gaming
- Aesthetic pleasure

³⁵ Oomen and Aroyo 2013.

³⁶ Ponciano and Brasileiro 2014.

³⁷ Ponciano and Brasileiro 2014: 248.

³⁸ This classification will look rather multifarious, as it derives from an effort to collate evaluations of participant motivations undertaken in science, social science and humanities crowdsourcing.

³⁹ Compared to crowds (in the qualitative rather than quantitative sense of this word), for virtual communities, the challenge is more focused on the solution of a problem that, in many cases (e.g. when Critical Participatory Action Research is applied), is central to their own lives.

It is important to get to know participant motivations and understand that they are in constant flux, in order to handle them well. Evaluating them continuously over time and through a range of methods – quantitative and qualitative – is a key step towards ensuring that activities are of value to those involved. Too often, collaborative research (whether online or offline) is considered intrinsically positive, rather than a neutral term that can potentially produce both positive and negative outcomes.

4.2 Who is participating?

Who is involved in online research collaborations is, of course, closely related to the collaboration models that are implemented and to personal motivations for participating. No matter the approaches that are utilised, however, there will always be somebody who is included and someone who is not. This is partly the result of strategic choices, as noted by Theodore Zamenopoulos and Katerina Alexiou in their review of co-design for this series, and partly an outcome of structural and cultural issues underlying digital (in)equality.⁴⁰

Participating in Internet-enabled activities requires access to technologies and digital and conventional literacy, as well as time and energy, which might become a barrier, especially for individuals with lower income, lower levels of formal education, and those from more disadvantaged groups in society. This is also true for younger demographics and replicates a situation of social inequality that predates the diffusion of digital technologies.

Even amongst people who have access to the Internet and to the devices that are needed in order to connect (from smartphones to laptops), attitudes towards Internet use can vary substantially. Some will turn to it only to complete very specific everyday tasks (home banking, booking a doctor's appointment, etc.), others for more numerous and creative activities. A survey of the UK population undertaken in 2010, for example, has helped to shed light on the multiple ways in which the population engaged with culture online, highlighting that only 11% of the sample was part of the 'leading edge', and 'enjoyed creating as well as accessing, learning, experiencing and sharing content'.⁴¹

It will not be surprising that a number of studies within online citizen science, digital public archaeology and the digital humanities have reported that crowdsourcing activities tend to be popular amongst people who are active or retired professionals and students, and who tend to have qualifications at university degree level or above. As explained in Section 2, the spread of university education is one of the key factors for the very rise of these practices in recent years, together with increased life expectancy for retired workers and the greater availability of free time during the weekend.⁴²

⁴⁰ Zamenopoulos and Alexiou 2018.

⁴¹ Bonacchi 2017.

⁴² Haklay et al. 2018.

5. CONTEMPORARY DEBATES

5.1 Power and vulnerability

Various socio-demographics account for digital divides. In addition to the power imbalances that lie at the basis of online research collaborations, however, there are also those that are expressed through or activated by such initiatives. The surge of participatory digital cultures has compromised the viability of privacy as a concept, since, within the structure and workings of our digital society, it is virtually impossible to avoid sharing data and information. Moving from this, Charles Ess argues that, whereas with modernity ethical agency and responsibility were considered primarily in terms of the individual, the rise of networked communications enabled by the Internet corresponds to more relational ideas of selfhood and identity.⁴³ This shift is linked with a negative perception of privacy, where isolation and being alone are viewed as less desirable and, thus, as choices that can potentially 'hide' something that might not be positive. As the ideas of constant surveillance and relational identities go hand in hand, the centre of ethical concerns moves from issues of privacy to those relating to the management of data and the power relations involved in online participation.⁴⁴ Here, I touch upon four core aspects concerning power.

1. Participation or exploitation?

As underlined above, participants in projects where monetary rewards are not available tend to be more educated and more affluent than those who are not participating. Demographics change if we introduce a reward and the cohort of *citizen researchers* becomes more diverse but also, potentially, more prone to exploitation, since people engaged with websites such as the Amazon Mechanical Turk are not, for the most part, hobbyists or rare contributors, but individuals who meet some of their primary needs by working long hours without comprehensive social rights protection.⁴⁵ Crowdsourcing especially seems to be caught in an endless tension between voluntarism and labour, inclusivity and exploitation, which begs the question of where we stand and what we choose. A value-orientated approach to ethics could be the internal compass to address inequalities on a case by case basis, making sure that norms and values are clear and shared and that they are upheld and assessed in a responsive way throughout a project. Additionally, contributions should not be invisible but appropriately credited, with clear buy-in for all those involved. The release of data in an open format is, of course, of key importance to ensure that contributions are not devalued.

⁴³ Ess 2014.

⁴⁴ Sylvia 2016.

⁴⁵ Williamson 2016.

•
Digital media education and training in software programming could help citizens become savvier about the management of their own data, and abler to tap into web data sources.
•

⁴⁶ Thierer 2014.

⁴⁷ Gibney 2017.

⁴⁸ Gibney 2017; Bonacchi et al. 2018 for an example of ethical statement in the context of a study of public perception of the ancient past in the context of Brexit.

2. Corporate or citizen power?

To some extent, the proliferation of online collaborative research is undoubtedly feeding the agendas of those companies that run the platforms used to connect and produce knowledge, and especially social networking sites. Utilising Facebook or Twitter entails sharing information that is then leveraged to boost the profits of those brands as well as of the third parties that benefit from the insights that are gathered through social media. This might be leading to a disproportionate concentration of power in the hands of pockets within the corporate sector. Such a dynamic, however, could change in the longer-term. Digital media education and training in software programming could help citizens become savvier about the management of their own data, and abler to tap into web data sources.⁴⁶ Perhaps this would also help erode commercial enclosures and push the public release of social media data.

3. Decolonisation

Online collaborative research may open up possibilities for decolonising Western-centred agendas and resources, through participatory digital repatriation and the release of tangible and intangible heritage housed in museums, archives, libraries and galleries in the form of open data, available for anybody with the access, skills and knowledge that are necessary to explore, tweak and utilise it. Data is a source of power and one that museums are still, in many cases, holding on to for reasons of profit and prestige, whilst the regulation of data licensing remains very much subject to the will of individual organisations.

4. Ethical management of web data in unintended collaborations

Ethics guidelines for studies that draw on online data are not univocally defined and research institutions can regulate the management of web data differently.⁴⁷ The common starting point for the discussion is usually that data that is publicly available online – e.g. data shared via social networking sites using a 'public' settings option – is viewed as 'published'. As such, it is often considered legitimate to extract and use it for research purposes, as long as anonymity is guaranteed. This poses a number of questions, since, for example, private individuals who share the data might not be aware that it could be accessed to achieve certain research goals and some citizens might in fact not welcome any such use. However, asking for informed consent is, in most cases, impossible due to the sheer number of people that would need to be contacted. Moreover, if data is not interpreted in an aggregated way and citations are included in a publication, it becomes even more difficult to protect anonymity, as the author of a quote may – in some cases – be traced back via web searches. Solutions are often sought and found on a case by case basis, whilst recent and larger projects are approaching the subject more comprehensively and in depth.⁴⁸

5.2 Epistemologies

How are Internet-enabled participatory practices changing what we research and the ways in which we produce knowledge?

1. Reliable agency

Online participatory research entails contributions that may or not be anonymous. We are often inclined to think that anonymity coincides with less control over the quality of the data or information that is produced, but this is not necessarily the case. In the context of knowledge created via digital collaborations, Mößner and Kitcher define epistemic opacity as follows:

A source is epistemically opaque for a seeker when the seeker cannot apply the markers available so as to vouch for the reliability of that source. You can be fully aware of the name on the internet post about the health effects of drinking a glass of red wine a day, but that doesn't help in deciding whether to lay in a case of pinot noir. What you need to know is whether this source has any access to relevant evidence and whether the source can be trusted to offer an impartial perspective.⁴⁹

Online groups such as open source communities can push forward epistemic democracy by putting in place four mechanisms that address epistemic opacity without necessarily ruling out anonymity: modularisation – the subdivision of larger projects in smaller units; formalisation of procedures; division of roles; and the division and organisation of responsibilities to facilitate decision making (Figure 2).⁵⁰

Mechanism	Explanation
Modularisation	'Groups decided to divide large projects into small subunits...
Formalisation	...to establish standardized tools and procedures for collaborative enterprises
Division of roles	...to assign particular roles to participants (such as 'read only' or 'edit')
Decision making	...and to introduce more hierarchical structures of decision-making by subdividing responsibilities' ⁵¹

Figure 2
Mechanisms that can be set by online groups to overcome epistemic opacity

⁴⁹ Mößner and Kitcher 2017: 9.

⁵⁰ Mößner and Kitcher 2017: 19; de Laat 2010: 333.

⁵¹ Mößner and Kitcher 2017: 19.

▼

Even when the analysis of big data is not part of the picture, the information that is generated via Internet-enabled group activities is somehow ephemeral and needs convincing plans for data archiving, to ensure it is not lost over time and can be of long-term research use.

▲

2. Actionable knowledge and the citizen researcher

Participation in research through new digital media makes it possible to 'transcend the divide between experiential knowledge, formal science and socio-political decision-making'.⁵² It does so by opening a public sphere where communication happens, with the result of effectively supercharging fluidity between pure research, public uses of data and knowledge produced, and social change. Online collaborations are thus fed by and push forward a re-definition of the role of the 'traditional academic' as both facilitator and 'pure scientist'.⁵³ To be effective facilitators, however, academics are in need of greater opportunities of development, to learn how to use digital technologies efficiently and to engage individuals, building crowds and communities that transcend the academy.

3. Short-lived and exploratory

Research that takes place online through both intended and unintended collaborations, as described above, is in constant flux and difficult to map against a 'population'. It often leads to the production of large datasets that sometimes have the characteristics of big data, which, drawing on an extensive review of literature, Rob Kitchin defines as having sheer size, velocity and variety, exhaustive scope, fine-grained resolution, relational nature, flexibility and variability.⁵⁴ The analysis of this data bridges traditional divisions between quantitative and qualitative research, and opens up opportunities for investigations that can be simultaneously extensive and locomotive.⁵⁵ Even when the analysis of big data is not part of the picture, the information that is generated via Internet-enabled group activities is somehow ephemeral and needs convincing plans for data archiving, to ensure it is not lost over time and can be of long-term research use.

⁵² Certomá and Pimbert 2015.

⁵³ Rockwell 2012.

⁵⁴ Kitchin 2013.

⁵⁵ Housley et al. 2014.

6. CASE STUDY 1: MICROPASTS

In this section and the following, I will introduce two case studies, respectively *MicroPasts* and *TrowelBlazers*, that I have chosen to further explore some of the concepts I have examined so far. Importantly, these two initiatives are complementary in helping to shed light on two different levels of citizen participation in the collective production of knowledge about the human past: *MicroPasts* is veered towards *contributory* engagement, while *TrowelBlazers* fully embraces *co-creative research*.

6.1 Who and why?

MicroPasts was established in 2013 by a group of researchers based at the UCL Institute of Archaeology (UCL IoA) and the British Museum. The project was led by Andrew Bevan, from the UCL IoA, and Daniel Pett, from the British Museum, and funded by the UK Arts and Humanities Research Council (AHRC), under the Digital Transformations in Community Research Co-Production in the Arts and Humanities call (*Figure 3*). Funding lasted initially for a period of 18 months – the maximum allowed – and then continued until 30 October 2015, thanks to additional funding from the AHRC Follow-on Funding for Impact and Engagement programme. I was personally involved as post-doctoral research associate together with Adi Keinan-Schoonbaert, while Jennifer Wexler and Neil Wilkin arranged access to Bronze Age and other collections at the British Museum.

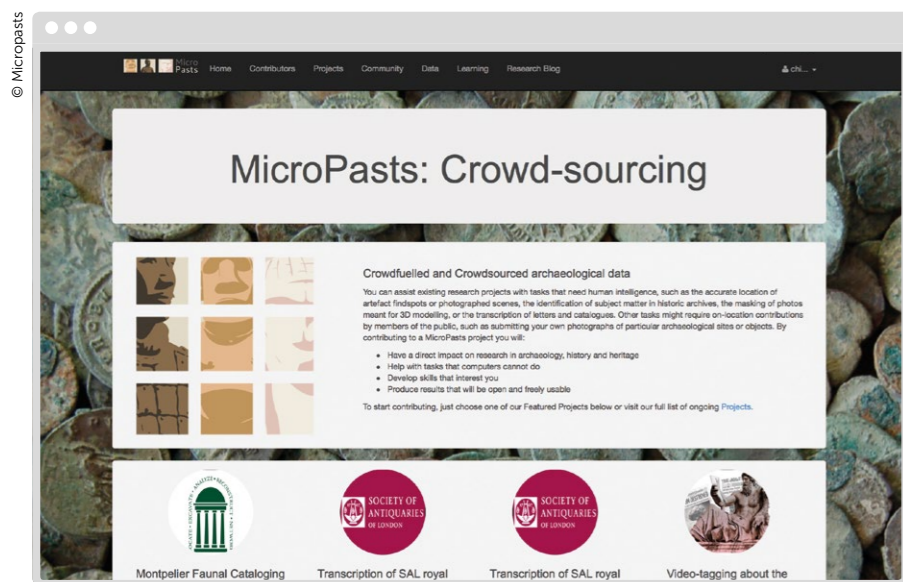


Figure 3
Screenshot from the Home page of the *MicroPasts* crowdsourcing website.



Figure 4
The National Bronze Age Index.

The idea behind *MicroPasts* emerged soon after viewing the funding call, which seemed a great opportunity to weave interests that different members of the team had in crowdsourcing and big data in archaeology, digital engagement with museums and the past, community archaeology and heritage values. The proposal was written jointly by three of the team members,⁵⁶ submitted by the end of June 2013 and evaluated positively over the months of July and August for a start on 1 October 2013. The aim of *MicroPasts* was to leverage crowdsourcing, crowdfunding and other web-based methods to establish collaborations between citizens inside and outside heritage-related institutions (including university departments, museums, libraries and archives) in order to study the human past together. We wanted to create an online group of people, by tapping into communities of interest in the past that were already present offline, such as visitors to the British Museum, metal detectorists involved with the *Portable Antiquities Scheme* for the public reporting of metal finds in England and Wales, and archaeological and historical societies with whom the team had contacts.

Through this work, we wished to develop, test, implement and promote a methodology deriving from and intertwining public archaeology and computational archaeology traditions. In addition, we intended to open up archaeological research to the groups mentioned above as well as to an unknown online crowd, while simultaneously addressing the challenge of financing specific types of activities that are nevertheless essential for research (e.g. post-excavation analysis, surveys, etc.). In our case, this work initially revolved around an archive housed by the British Museum and containing about 30,000 object cards that documented metal objects retrieved in the UK during the 19th and early 20th centuries. This paper archive is also known as the National Bronze Age Index (NBAI), an under-utilised source of information that could be pivotal to advance knowledge of various aspects of British prehistory (*Figure 4*). Several attempts to digitise the NBAI had been made without success, so, crowdsourcing appeared a very well-suited method to make sure that more than a handful of visitors physically travelling to the British Museum stores could access the NBAI and benefit from it in different ways.

⁵⁶ Bevan, Pett, Bonacchi.

6.2 How it happened

The team spent the first six months developing the MicroPasts platform, which consisted of: a crowdsourcing website to co-produce open data in archaeology, history and heritage; a forum to discuss possible uses of this data as well as future projects and the structure and management of the websites themselves; a data centre, where both raw and crowdsourced data was released under a [Creative Commons license](#) as soon as it became available;⁵⁷ a page dedicated to learning, a research blog and a crowdfunding website for the micro-financing of community archaeology and community history projects that had been co-designed and, if funded, would be undertaken jointly by 'traditional researchers' and communities.⁵⁸

All these resources were developed using Free and Open Source Software and collaborative coding, keeping track of the software versions that were created; the software produced is stored and made publicly available through the [MicroPasts GitHub](#) account. Here it is important to note that, although Daniel Pett was the technical lead of the project, over time the team as a whole improved their technical and programming skills, building internal capacity and decreasing the need to outsource technical tasks.

The crowdsourcing website was built with the [Crowdcrafting](#) framework developed by Daniel Lombraña Gonzales, whereas the main MicroPasts website utilises [WordPress](#) with the [Discourse](#) plugin chosen to power the community space. Since 2014, the crowdsourcing site has been hosting applications developed in-house by the team by tweaking existing templates that had been designed as part of the Crowdcrafting initiative. Each template is modular and, as such, it can be adjusted easily to perform the same function on similar kinds of collections. For example, the template we deployed for the transcription and geo-referencing of NBAI object cards ([Figure 5](#)) was subsequently adapted and re-utilised for other archives containing structured textual data.

Another application has been focusing on photomasking, inviting people to draw the outlines of objects on sets of photos taken all around those objects, in order to mark the separation between an artefact and its background ([Figure 6](#)). The 'masks' created in this way have been used offline to generate 3D models of high research quality, through a method called [photogrammetry](#) ([Figure 7](#)).⁵⁹ We also developed templates to aid the classification of photographic archives via photo-tagging, the transcription of tabular data, unstructured text and sound, and the analysis of audio-visual content through tagging.

57

Creative Commons licenses are receiving greater attention and their use is – rightly – strongly advocated by many in the sector. These licenses have the advantage to help creators of content 'retain copyright while allowing others to copy, distribute, and make some uses of their work – at least non-commercially' (Creative Commons 2017).

58

The crowdfunding component worked rather independently from the others and I will not examine it in this review (for reflections on the crowdfunding case study, however, see Bonacchi et al 2015).

59

Bevan et al. 2014, Hess and Robson 2010.

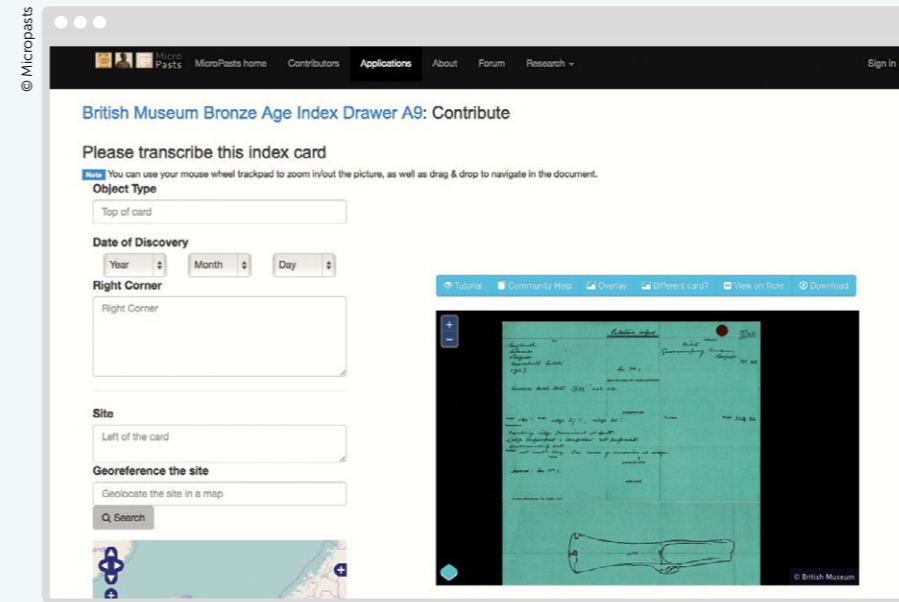


Figure 5

Screenshot showing the functionality of the MicroPasts crowdsourcing application for the transcription and geo-referencing of object cards documenting metal finds retrieved historically in Britain and stored in the NBAI.

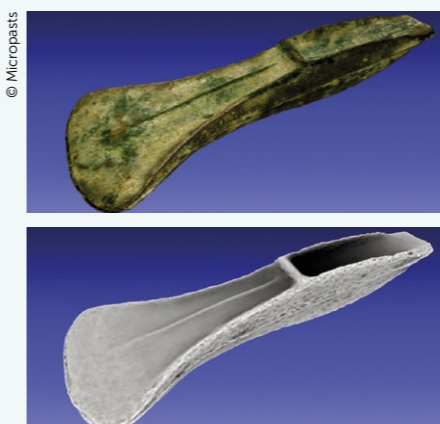
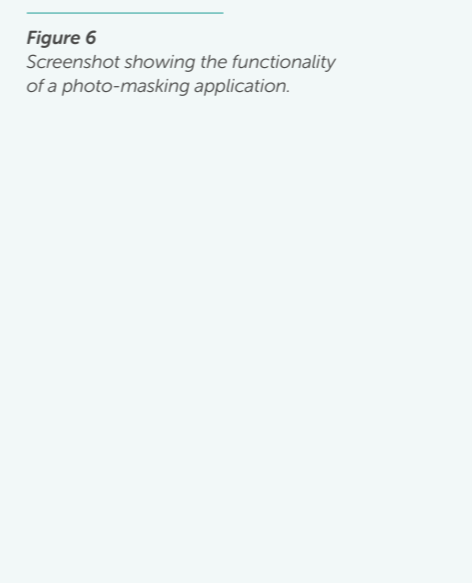


Figure 6

Screenshot showing a 3D model created through photogrammetry and using photos the masking of which was crowdsourced via the MicroPasts website, through the process shown in [Figure 6](#).

Figure 6

Screenshot showing the functionality of the MicroPasts crowdsourcing application for the transcription and geo-referencing of object cards documenting metal finds retrieved historically in Britain and stored in the NBAI.

7. CASE STUDY 2: TROWELBLAZERS

7.1 Who and why?

TrowelBlazers reached their fifth anniversary in May 2018.⁶⁰ The initiative started in 2013, from a casual interaction of its core founders (team *TrowelBlazers*) – Brenna Hassett, Victoria Herridge, Rebecca Wragg Sykes and Suzanne Pilaar Birch – who, at the time, were *Early Career Researchers* (ECR). These four women had just finished their postgraduate studies, and found employment in research-intensive institutions in the UK, the US and France; they knew each other individually but had never met all together.

As is increasingly common, they were using Twitter as an ECR support network, where they could discuss topics related to their research, but also to academic life. The day it all began, the conversation was about the under-representation of women in science and the observation that very few of the women who had been influential in archaeology were being or had historically been celebrated. The exchange was fuelled by the outrage generated by a video that the European Commission had released the previous year with the supposed intent of promoting women in science but, in reality, showing ‘female models in and out of lab coats designing lipsticks and catching the attention of an attractive male scientist’.⁶¹

An email thread followed and the idea behind *TrowelBlazers* started to take shape. It would be an initiative aiming to ‘reset imaginations’ about the role of women in the earth sciences – archaeology, palaeontology and geology – and the very conception of these disciplines as more inclusive and better represented environments.⁶²

7.2 How it happened

The project was set up with no dedicated funding and was exclusively based on the enthusiasm, time and resources of its founders, alongside their awareness of and interest in digital public archaeology. Over a period of four weeks, the team created a Tumblr, a Twitter profile and a dedicated email account for *TrowelBlazers*. Tumblr was a particularly good solution for showing highly visual content, with the purpose of changing the very look and feel of the disciplines concerned and of giving back a face and presence to women who had been forgotten in their own fields and beyond. The idea was, originally, that the team would write articles about these women and so it happened: Tumblr was launched with pieces about female archaeologists and palaeontologists who had played a key role in all four team members’ professional development.

⁶⁰ Details about this case study were drawn from the *TrowelBlazers* websites, two main outputs that were kindly shared by the authors (Hassett et al. 2014, Hassett et al. 2018) and an interview with *TrowelBlazers* team member Brenna Hassett.

⁶¹ Hassett et al 2018. The video was later on removed and an official apology was issued.

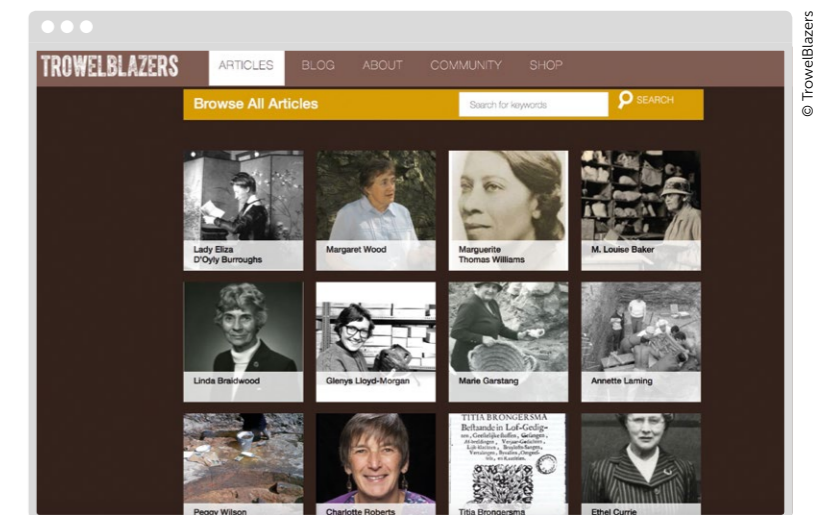
⁶² Quote from Brenna Hassett, personal communication.

Very soon, however, the team realised that there was energy and desire to be engaged from a wider group, therefore, they made their mission more strongly collaborative, officially opening up opportunities for public submissions of articles. *TrowelBlazers* thus started to reach out, becoming an online virtual community of people coming together to research, write and publish biographies – a collective with knowledge production and activist aims. The community works to provide fun and accessible examples of women in the earth sciences to counter negative stereotypes and alleviate the extra burden that women in under-represented groups have to face. Today there are over 180 articles on the *TrowelBlazers* website, each including a short biography, archival photos and records (Figure 9). 80% of these bios were written by contributors beyond the core team of four, who then edited and included additional content where necessary. These individuals had come into contact with *TrowelBlazers* through various routes, but Twitter played a key role in attracting attention and engagement.

The community is composed of retired people, students (some of whom have left the discipline) or family members of the women being portrayed and professionals based in museums, archives and heritage-related organisations, who suddenly discover ‘unknown’ and forgotten female scientists. Other contributors are very much like the initiators of the project – i.e. researchers writing about their mentors or others who they know have worked in the field – or people who just enjoy researching this kind of material and intellectual and social history.

At the moment, the *TrowelBlazers* team is mainly focused on the management of the platforms rather than on writing new content and to perform these tasks they do not have any official form of organisation, providing input as and when needed. Their main efforts are aimed at ensuring the website is a lively presence, so that it continues catering for existing audiences while striving to reach new ones. This way of structuring their activity is a result of the difficulty they have encountered in funding the project via bespoke grant schemes, of the *ad hoc* nature of the financial aid they have been able to secure (e.g. through crowdfunding or project-specific sums from societies) and of the responsibilities they hold as their careers and lives move forward.

Figure 9
Screenshot from the *TrowelBlazers* webpage showing some of the 180 articles that the community has contributed to present.



The group could not identify a funding strand that would allow them all – only one TrowelBlazer is in a permanent position in the US – to lead on a grant proposal. Furthermore, the project had a very unique blend of research and engagement that they were not sure would be welcomed by a research funding body. At the same time, they were transitioning from Early Career stages to more pressurised (albeit still intermittent and precarious) jobs in academia and starting families, which translated into more limited time available for side projects for which they did not feel they were receiving institutional support.

7.3 Outcomes

There are now more than 180 short biographies on the TrowelBlazers website and, thanks to the contribution of the community, these posts are exposing the diversity of women in the earth sciences, with stories that come from countries other than the UK and US, and are told in languages other than English. A number of additional undertakings and engagements have also cropped up as 'spill outs' of the online collaborative research that was conducted. These included, but are not limited to, the co-design of *Fossil Hunter Lottie doll* in partnership with the toy company Arklu, talks for museums or organisations such as the Chartered Institute for Archaeologists and the touring *Raising Horizons exhibition*. Such work differs from the community-responsive nature of TrowelBlazers.com (and associated social media platforms), in that content was developed solely by the core team together with the respective external party. As such, discussion involved more reflection on how the team viewed TrowelBlazers' aims and values, in contrast to the deliberately 'light-touch' approach to website editorial, in which multiple views and voices are given a platform. These external collaborations gave the team a sense of reward that their efforts were being noticed and valued.

There was no exact list of planned outcomes at the beginning of this project, only a mission, so anything that has happened since 2013 feels to the four founders like an amazing result. The main achievement is probably to have ensured greater recognition of women in the earth sciences, highlighting not only the fact that there have been more women involved than one might think, but that they were often also interconnected.

▼
There are now more than 180 short biographies on the TrowelBlazers website and, thanks to the contribution of the community, these posts are exposing the diversity of women in the earth sciences.
▲

8. REFLECTIONS AND CONCLUSION

I will take inspiration from the two case studies I have presented, to briefly highlight current challenges in online collaborative research, starting with funding. In the last few years, there have been a number of funding schemes dedicated to enable online collaborative research, and this has been critical to allow important exploratory work to take place. However, the duration of these schemes has not always been ideal for the purpose of establishing digital engagement programmes entailing the technical development of new web platforms.⁶³ Furthermore, the TrowelBlazers case study has shown how the structure of research grants might be engineered in a way that limits inclusivity and viability, especially when it comes to Early Career Researchers who are not permanent members of staff and do not hold contracts exceeding the duration of a potential project. It is thus pressing that funding bodies respond more fully to the current organisation of academic labour and unlock opportunities for ECRs in less stable positions to pursue funding streams for online collaborative research.

A second aspect in need of close examination is sustainability. This can be broken down into three core components: legacy, reproducibility and scalability. By legacy, I mean the longer-term life of the project beyond its funded period (or setting-up phase), through the survival of the values more than of the resources that were created. Online collaborative research uses web infrastructures of various kinds and there will be a point when these infrastructures become obsolete. From a practical point of view, we can look to minimise this problem by using Free and Open Source Software, which brings maintenance costs down to (virtually) zero, especially if we consider the possibility of drawing on the support offered online by 'hacker' communities (see, for example, *Stack Overflow*). On a more conceptual level, as noted by Andrew Prescott and Peter Webster, it is critical to move away from the idea of *infrastructure* itself, and embrace a more fluid one of *ecology*, which presupposes that there will be technological change: *sustaining* thus becomes a continuous process of problem-solving rather than a technical preservation task in the narrowest meaning of the term.⁶⁴

⁶³
See Causer et al. 2012.

⁶⁴
Prescott 2016; Webster 2018.

Following this line of reasoning, we are then called to resolve issues relating to process management, which may sometimes be addressed by embedding participatory methods in researchers' workflows, possibly reducing their intensity to suit the transformation from funded project to (nearly) self-sustaining practice. This is the path we chose for MicroPasts, moving all the websites to a cloud server that we pay for out of our own pockets. Problematic? Potentially, but the decision to continue running the platform was a priority for our team, having seen the value it was generating for those involved. Of course, there should never be the expectation that researchers cover resource-related costs personally, hence the importance of considering *legacy*, which entails the reproducibility and scalability of the model that is proposed. Even if MicroPasts ceased all activities tomorrow, there would be software available for any other individual or organisation interested in experimenting with crowdsourcing, with guidelines to help them use it. Furthermore, the software can be modified rather easily and adapted for the needs of very small or very large institutions, for very small or very large collections.

The tension between organisational identity and sustainability is also of relevance. Organisations that look to engage citizens are often interested in doing so through standalone projects that will help them promote their identities, but this often implies a drive away from the reuse of existing resources and the duplication of efforts. The best way of regulating this aspect remains perhaps that funders evaluate the originality of a project proposal and the degree of experimentation required against sustainability plans.⁶⁵ There is also, in fact, the need to protect the right to and benefits of failing in order to innovate.

Online participatory research is very prone to failure because it relies on the delicate equilibria of socio-technical systems in fast-changing media, communication and knowledge production landscapes. Hence, the importance for organisations to embrace calculated risks, rather than distancing themselves from them entirely. The very functioning of crowdsourcing, for example, depends on the ability to attract participants via online publicity; publishing articles in mainstream online newspapers and magazines is a proven way to bring together groups of people who do not necessarily know each other already.⁶⁶ This means that those who propose the activity must be willing to become exposed and accept the reputational risks that could derive from the outcome of the campaign and the ways in which results are managed.

Can everyone afford to take risks which might end up compromising their own image? This question does lead us to a broader point that relates to capacity, brand and power differences. Clearly, individuals and organisations that are more visible and effective online thrive more easily, thus those with stronger in-house Internet skills and knowledge – and with greater human and financial resources – will be more likely to succeed in engaging with online collaborative research, absorbing 'failures'. This is, however, where collaborations with existing initiatives that embrace *open philosophies* regarding software and data creation and sharing might help.

65

This specific issue was particularly discussed during the MicroPasts Knowledge Exchanges Workshop held in September 2015, as part of the AHRC-funded project following from the original MicroPasts application (the event was recorded and presentations are available from the MicroPasts YouTube channel).

66

For example, see Causer and Wallace 2012.

Continuing with the topic of inclusivity or exclusivity of participation, as we have seen exemplified through the MicroPasts case study, online collaborative research – in line with a plethora of other crowdsourcing undertakings in the humanities and sciences – is often characterised by a pattern whereby certain demographics are more involved than others and a few people conduct the majority of the work. This aspect *per se* does not invalidate the relevance and potential positive impact and outcomes of this kind of initiative, but does have epistemological implications, since a small group of individuals can be responsible for the generation of most of the data, information and knowledge, often under the umbrella of a programme that is described as being open to 'everybody' internationally. The key point here is to make sure that there is clarity over the numbers of participants engaged and that these considerations become part of the methodological and ethical reflections that accompany the research outputs produced.

Democracy is not only a result of equal possibilities to 'access', but also of equal opportunity to express views. Whether or not this happens is partly a product of the ways in which technology has been designed, and partly of how it is used and the kinds of human relationships that such technology helps to implement. Values and norms regulating an activity should be discussed at the beginning of every project and continuously reviewed, to make sure they are agreed upon and embraced. It is impossible to close every avenue for exploitation and abuse at design stage, and there will always be the possibility that these might occur. What is fundamental is that problems of this sort are promptly dealt with at individual and group level, whenever they surface, to ensure that they remain isolated incidents and are highlighted as distant from the values that online research collaborators share.

In conclusion, it is in this value-orientated ethical approach that I see the future of this methodology. We need to understand risks, but also accept some of them in order to fully, albeit carefully, experiment online. It is important to be strongly reflective in our practice, but, equally, to identify solutions and be engaged in the *co-production* process itself, not to stall in detached academic exercises of critique with limited beneficial impact on the generation of knowledge and on participants.

▼
Values and norms regulating an activity should be discussed at the beginning of every project and continuously reviewed, to make sure they are agreed upon and embraced.
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GLOSSARY

Big data

Big Data is data that possesses most of the following characteristics: very large volume, fast and continuous velocity, wide variety, exhaustivity, tight resolution, strong relationality, high extensionality and scalability (Kitchin and MacArdle 2016). The characteristic of exhaustivity mentioned in this model has however been critiqued by some commentators.

Citizen researchers

Citizens who undertake research in an area or domain in which they have not received dedicated training through courses and qualifications.

Citizen science

Scientific research undertaken by or in cooperation with citizen researchers.

Cloud computing

The distribution of resources including compute power, database space and applications on demand, via the Internet.

Co-creative research

Research that is developed in its aims and methods as well as undertaken together with citizen researchers.

Co-production

Research that is developed and/or undertaken together with researchers. It can be of a contributory, collaborative or co-creative kind.

Collaborative research

Research that is undertaken together with citizen researchers who not only contribute to the collection or enhancement of data, but also to aspects of its analysis and interpretation.

Contributory research

Research that is undertaken together with citizen researchers who mainly contribute to the collection or enhancement of data, without involvement in aspects of its analysis and interpretation.

Creative Commons licenses

There are several types of Creative Commons licenses, all of which, however, help creators to “retain copyright while allowing others to copy, distribute, and make some uses of their work — at least non-commercially” (Creative Commons 2017).

Early Career Researcher

Researchers are considered Early Career when they are in the early stage of their academic career after the completion of a doctorate. In the UK and most of other European countries, the Early Career phase is usually regulated by research funding bodies and higher education institutions as lasting up to five or seven years following a doctoral award.

Epistemology

The study of knowledge and its production.

GitHub

Open source platform for the collaborative creation, sharing and retrieval of software.

New media

Transformations in media production, distribution and use that follow the invention and widespread diffusion of new technologies.

Open innovation

Crowdsourced generation of ideas that might bring along improvements of product or process, and is achieved by seeking innovation both inside and outside the organisation, and pursuing ‘internal and external paths to market’.

Open philosophy

A philosophical standing that supports the ‘open redistribution and access to the data, processes and syntheses generated’ within a research domain (Beck and Neylon 2012: 479–480).

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