

Crowdsourcing Our Cultural Heritage: Introduction

Mia Ridge, Open University, UK

This book brings together for the first time the collected wisdom of international leaders in the theory and practice in the emerging field of cultural heritage crowdsourcing. It features eight accessible case studies of groundbreaking projects from leading cultural heritage and academic institutions, and four thought-provoking essays that reflect on the wider implications of this engagement for participants and on the institutions themselves.

Crowdsourcing, originally described as the act of taking work once performed within an organisation and outsourcing it to the general public through an open call for participants,¹ is becoming increasingly common in museum, libraries, archives and the humanities as a tool for digitising or computing vast amounts of data, whether the private correspondence of eighteenth century English philosophers (Chapter 3) or modern Dutch popular television (Chapter 7). Asking members of the public to help with tasks can be hugely productive – for example, participants in the *Old Weather* project (Chapter 2) transcribed over a million pages from thousands of Royal Navy logs in less than two years,² the entire 1940 US Census was indexed by 160,000 volunteers in just four months,³ the National Library of Australia's *Trove* project

¹ Howe (2006a)

² Brohan (2012)

³ 1940 US Census Community Project (2012)

has over 110 million transcription corrections and more than 2.5 million tags,⁴ and participants in the British Library's *Georeferencer* project have added spatial coordinates to thousands of historic maps.⁵ And cultural heritage crowdsourcing is not limited to transforming existing content into digital formats – Museum Victoria's *Describe Me* is crowdsourcing descriptions of their objects for people who are blind,⁶ *Snapshot Serengeti* asks people to identify animals recorded by remote cameras,⁷ and *Galaxy Zoo's Quench* project asks 'citizen scientists' to help analyse results and collaborate with scientists to write an article on their findings.⁸ But crowdsourcing in cultural heritage is more than a framework for creating content: as a form of engagement with the collections and research of memory institutions, it benefits both audiences and institutions.

Cultural heritage crowdsourcing projects ask the public to undertake tasks that cannot be done automatically, in an environment where the activities, goals (or both) provide inherent rewards for participation, and where their participation contributes to a shared, significant goal or research area. Crowdsourcing can be immensely effective for engaging audiences with the work and collections of galleries, libraries, archives and museums (GLAMs), and there is growing evidence that typical GLAM crowdsourcing activities

⁴ As of January 2014. Current figures are listed at <http://trove.nla.gov.au/system/stats?env=prod>

⁵ <http://www.bl.uk/maps/>

⁶ <http://describeme.museumvictoria.com.au/>

⁷ Kosmala (2013)

⁸ Trouille (2013)

encourage skills development and deeper engagement with cultural heritage and related disciplines.⁹ For organisations whose missions encompass engaging people with cultural heritage, there is increasingly a sense that, as Trevor Owens says in Chapter 12, the transcriptions produced are a ‘wonderful by-product’ of creating meaningful activities for public participation.

This book will help practitioners who wish to create their own crowdsourcing projects understand how other institutions found the right combination of source material and the tasks for their ‘crowd’ – typically, a combination of casual participants and dedicated ‘super contributors’ working online – to achieve the desired results. Investing resources wisely when building a successful crowdsourcing project requires an understanding of the motivations for initial and on-going participation, the characteristics of tasks suited to crowdsourcing, and the application of best practices in design for participation, content validation, marketing and community building. For readers interested in the workings of museums, libraries, archives and academia, this volume is an opportunity to hear from people behind the projects about their goals, their experiences building and launching crowdsourcing sites, what worked and what did not, how their designs improved over successive iterations and how these projects changed the host organisation. Sharon Leon’s report (Chapter 4) that almost 10 per cent of people registering to use the *Scripto* tool were motivated by curiosity about the

⁹ Ridge (2013); Dunn and Hedges (2012)

transcription tool and process suggests the need for this collection of in-depth reports.

The case studies in Part I of this book discuss a range of approaches taken to various materials, audiences and desired outcomes by a selection of internationally significant projects in museums, libraries, archives and universities. Part II features theoretical reflections on the impact of crowdsourcing on GLAM professionals; institutional relationships with audiences; audience engagement and organisational mission; and the implications of new models of authority. Together, the chapters collected here will help organisations understand both the potential of crowdsourcing and the practical and philosophical implications of inviting the public to work with them on our shared cultural heritage.

Background and context

As the pioneering projects described here inspire others, it is an apt moment to reflect on the lessons to be learnt from them. The projects discussed range from crowd-curated photography and art exhibitions to collecting objects at in-person ‘roadshow’ events. The number of projects in the emerging field of cultural heritage crowdsourcing increases constantly, and the subsequent lessons learnt by museums, libraries, archives and academia are gradually being absorbed back into those institutions and in turn inspire new ideas. A range of disciplines and roles have informed the perspectives collected here. They range from historians interested in scholarly editions of archival documents, to technologist- and collections-lead public engagement and data

enhancement projects in museums, to archivists considering the challenges of participatory archives. Further differences are apparent in the approaches museums, libraries and archives have developed to managing physical collections and the knowledge around them, and in their preferred forms of public access and engagement. However, as designs for online collections tend to follow similar principles, the disciplinary differences between the providers of those collections appear to be converging (at least from the audiences' perspective).¹⁰

Defining 'crowdsourcing' and related concepts

Since its coining by Jeff Howe and Mark Robinson in 2006, the term 'crowdsourcing' has been used as a label for a variety of new and pre-existing concepts. It is worth returning to Jeff Howe's 'White Paper Version' of their definition:

Crowdsourcing is the act of taking a job traditionally performed by a designated agent (usually an employee) and outsourcing it to an undefined, generally large group of people in the form of an open call.¹¹

Interestingly, Howe's 'soundbyte' definition of crowdsourcing – the 'application of Open Source principles to fields outside of software' – does not retain the problematic relationship with 'outsourcing', instead claiming an affinity with the highly skilled activities and mutually beneficial ethos of open source software development. Crowdsourcing in cultural heritage benefits from

¹⁰ For further discussion of this, see Duff et al (2013)

¹¹ Undated quote in the sidebar of Howe (2006b)

its ability to draw upon the notion of the ‘greater good’ in invitations to participate, and this may explain why projects generally follow collaborative and cooperative, rather than competitive, models. Concepts often grouped under the same ‘umbrella’ in the commercial crowdsourcing sector include ‘crowd contests’, or ‘asking a crowd for work and only providing compensation to the chosen entries’¹² and the ‘wisdom of crowds’ (collective decision-making or problem-solving), which is referred to in several chapters (particularly Chapter 1, but also Chapters 6, 7, 10 and 12). Crowdfunding, or crowdsourced fundraising, makes only a brief appearance (see Chapter 10) but is obviously an issue in which many institutions are interested. At first, GLAM crowdsourcing projects may look similar to Web 2.0-style user-generated content (UGC) projects which invite audiences to ‘have your say’. However, crowdsourcing projects are designed to achieve a specific goal through audience participation, even if that goal is as broadly defined as ‘gather information from the public about our collections’. Citizen science, where ‘volunteers from the general public assist scientists in conducting research’¹³ has been an influential model for humanities and ‘citizen history’¹⁴ crowdsourcing projects.

¹² Bratvold (2011). For an account of the dangers of crowd contests for GLAMs, see Sweetapple, Kate. 2013. “How the Sydney Design Festival Poster Competition Went Horribly Wrong.” *The Conversation*. May 24. <http://theconversation.com/how-the-sydney-design-festival-poster-competition-went-horribly-wrong-14199>.

¹³ Raddick et al. (2010).

¹⁴ Frankle (2011)

‘Crowdsourcing’, whether in commercial, heritage or academic sectors, is suffering the fate of many buzzwords as its boundaries are pushed by those with something to sell or careers to make. Alexandra Eveleigh points out in Chapter 9 that the term is applied broadly, and even retrospectively, to ‘almost any initiative in the field which seeks to engage users to contribute to archives or to comment upon archival practice’ online.¹⁵ Various definitions of cultural heritage crowdsourcing reveal unresolved tensions about the role of expertise and the disruption of professional status, or lines of resistance to the dissolving of professional boundaries. Ultimately, however, definitions that seek to draw a line around crowdsourcing so that some projects can be ‘in’ while others are ‘out’ are less useful than thinking of crowdsourcing in cultural heritage as a coalescence around a set of principles, particularly the value placed on meaningful participation and contributions by the public.

Defining ‘the crowd’ in cultural heritage crowdsourcing

While ‘crowdsourcing’ is a useful shorthand, many projects and writers have used other terms for ‘crowd’ participants, such as ‘community-sourcing’ (Chapters 4, 11), ‘targeted crowdsourcing’ (Chapter 6), or ‘microvolunteering’ (Chapter 5), acknowledging that often the crowd is neither large nor truly anonymous, but perhaps also reflecting discomfort with the broadness, anonymity or vagueness of ‘the crowd’. These terms additionally reflect the fact that while some cultural heritage crowdsourcing projects are inspired by a

¹⁵ See also Estelles-Arolas and Gonzalez-Ladron-de-Guevara (2012) and Ridge, Mia. 2012.

“Frequently Asked Questions About Crowdsourcing in Cultural Heritage.” *Open Objects*.

<http://openobjects.blogspot.co.uk/2012/06/frequently-asked-questions-about.html>.

desire for greater public engagement, the more specialised the skills, knowledge or equipment required, the more strongly a ‘crowd-sifting’ effect operates as individuals unable to acquire the necessary attributes fall out from the pool of potential participants (as discussed in Chapter 3).

Models for crowdsourcing in cultural heritage

The issues facing contemporary crowdsourcing projects are not new. Accepting contributions from members of the public for inclusion in collections documentation and other informatics systems has always raised issues about how to validate those contributions. Nineteenth-century natural historians corresponding with amateur observers about the distribution of botanical specimens had to try to determine the veracity and credibility of their contributions,¹⁶ just as modern manuscript transcription projects such as *Transcribe Bentham* (Chapter 3) initially questioned the editorial quality of volunteer-produced transcripts. The Smithsonian Institution has a long history¹⁷ with ‘proto-crowdsourcing’, as does the Oxford English Dictionary (OED), whose editor launched in 1879 an ‘Appeal to the English-speaking and English-reading public’ to help provide evidence for the history and usage of

¹⁶ Secord (1994)

¹⁷ For examples, see Millikan, Frank Rives. 2012. “Joseph Henry: Father of Weather Service.” *The Joseph Henry Papers Project, Smithsonian Institution Archives*. Accessed October 28.

<http://siarchives.si.edu/history/jhp/josepho3.htm> and Bruno, Elena. 2011. “Smithsonian Crowdsourcing Since 1849!” *Smithsonian Institution Archives*. April 14.

<http://siarchives.si.edu/blog/smithsonian-crowdsourcing-1849>.

words to complete the dictionary.¹⁸ Many chapters relate crowdsourcing to long traditions of volunteer augmentations of GLAM collections (see for example Chapter 6). Technology has enabled crowdsourcing as we know it, but models for public participation in collection, research and observation pre-date it. The ability of digital technologies to provide almost instantaneous data gathering and feedback, computationally validate contributions, and the ability to reach both broad and niche groups through loose networks have all been particularly important in the modern era. As some chapters explicate, the ability to computationally track data provenance and verify remediated primary sources are particularly important for scholarly projects. Digitisation has also helped manage the limitations of physical space, conservation, location and opening hours that previously affected access to collections.¹⁹

UNESCO's definition of 'cultural heritage' as 'the legacy of physical artefacts and intangible attributes [...] inherited from past generations' provides a broad outline for this book. Cultural heritage crowdsourcing projects have followed a variety of models, including 'commons-based peer-production' and participatory archives (see Chapters 4 and 9). The National Library of Australia's *Trove*²⁰ Optical Character Recognition (OCR) correction project (and

¹⁸ Gilliver (2012). The original text of the 1879 appeal is available at <http://public.oed.com/history-of-the-oed/archived-documents/april-1879-appeal/april-1879-appeal/>

¹⁹ Ridge (2013)

²⁰ <http://trove.nla.gov.au/>

Rose Holley's excellent articles on its genesis, process and results²¹) has been hugely influential. The Zooniverse²² suite of citizen science projects, from *Galaxy Zoo* on, has been particularly important, and some cultural heritage organizations have used the underlying software platform for their own projects. Lori Byrd Phillips examines the evolution of the open source model as a form of 'barn raising' by online communities in Chapter 11, and several other authors cite the open source software movement as a model for their own projects or have released the code for their crowdsourcing tools under open source licences. Some crowdsourcing projects were inspired by organisational missions – in Chapter 1, Shelley Bernstein relates Brooklyn Museums' innovative digital projects to their 'community-driven mission'. Others realise the potential importance of crowdsourcing to their mission through developing projects – Michael Lascarides and Ben Vershbow (Chapter 5) report that the New York Public Library came to regard crowdsourcing 'not only as way to accomplish work that might not otherwise be possible, but as an extension of our core mission'. In Chapter 6, Lyn Lewis Dafis, Lorna M. Hughes and Rhian James's translation of 'crowdsourcing' into Welsh ('*cyfrannu torfol*') highlights the 'collective contributions' and community engagement so important to the National Library of Wales.

Common tasks in cultural heritage crowdsourcing

Generally, the tasks performed by participants in cultural heritage crowdsourcing involve transforming content from one format to another (for

²¹ See for example Holley (2009) and Holley (2010)

²² <http://www.zooniverse.org/>

example, transcribing text or musical notation), describing artefacts (through tags, classifications, structured annotations or free text), synthesising new knowledge, or producing creative artefacts (such as photography or design).

Additional semantic context is required for structured text search – for example, searches for specific entities like people, places or events within large datasets – and can be supported through ‘structured transcription’, in which metadata that describes the entity through emergent or externally defined concepts is recorded alongside the transcribed text. Two common approaches to structured transcription are discussed in various chapters. The *Transcribe Bentham* project (Chapter 3) uses full text transcription wrapped in descriptive ‘inline’ tags, while user interfaces for *Old Weather* (Chapter 2) and *What’s on the Menu* (Chapter 5) are designed to transcribe relevant sections of text into pre-defined fields.

The inherent variability of materials in cultural heritage collections means that the same class of task – whether transcribing handwriting, tagging a painting or georeferencing a map – could be quick and uncomplicated or could require tricky subjective judgement to accomplish, depending on the legibility of the source material and the cognitive overhead required to (for example) add structured mark-up or choose between hierarchical subject terms. While many chapters focus on digitising documents as varied as wills and menus, other tasks include crowd curation and creativity around artworks and photography, creating descriptive tags for paintings and time-based annotations for audio-visual archives, and geo-referencing maps. Some participants prefer apparently ‘simple’ tasks like correcting errors in OCR-generated transcriptions or

classifying images (though their requirement for sophisticated visual processing and pattern recognition is a form of ‘human computation’ that computers cannot easily manage), while others prefer more complex tasks that require subjective judgement or specific skills or knowledge.

Key trends and issues

To paraphrase a military adage, it seems ‘no plan survives contact with the crowd’, and many initiatives change significantly after their initial launch. Several successful case studies report on iterative improvements to interfaces, in part because a high quality ‘user experience’ (particularly task design) is vital for creating interfaces that are both productive and engaging. Chapter 4 discusses improvements to the *Scripto* interface designed to help transcribers work with documents more effectively, Chapter 5 describes tweaks to the *What’s on the Menu?* interface, and Chapter 3 reports on newly launched (at the time of writing) improvements to the *Transcribe Bentham* interface.

Contact with participant communities also seems to change a project in more fundamental ways, including the development of new research questions. As Lucinda Blaser reports in Chapter 2, *Old Weather* was initially promoted ‘as a climate science project as this was the scientific goal of the project, but the audience saw it as a historical research project’. If crowdsourcing projects are almost inevitably changed (and changed for the better) by contact with the crowd, they necessarily create a challenge for any organisations and funders used to regarding the website launch as the end of their active involvement with a project. The resources and workflows required for community management (for example, content moderation, communication and updates

on progress) and maintaining the supply of content are relatively new for many organisations, even when some tasks can themselves be crowdsourced.

When Howe stated that a ‘crucial prerequisite’ in crowdsourcing is a ‘perfect meritocracy’ based not on external qualifications but on ‘the quality of the work itself’,²³ he created a challenge for traditional models of authority and credibility. This challenge underlies many reflections in this volume, particularly those of Lori Byrd Phillips in Chapter 11. A model for public participation in science research devised by Bonney et al²⁴ is useful for categorizing non-commercial crowdsourcing projects according to the amount of control participants have over the design of the project itself – or to look at it another way, how much authority the organization has ceded to the crowd. Their model contains three categories: ‘contributory’, where the public contributes data to a project designed by the organization; ‘collaborative’, where the public can help refine project design and analyse data in a project lead by the organisation; and ‘co-creative’, where the public can take part in all or nearly all processes, and all parties design the project together. It may be that by providing opportunities to help define questions for study or analyze data (rather than merely contribute it), collaborative project structures are a factor in successfully encouraging deeper engagement with related disciplines.

Several chapters (including Chapters 2, 8 and 10) discuss the ways in which the crowd may also be changed by their contact with cultural heritage organisations, interests and collections. A strength of this volume is the

²³ Howe (2006a), Howe (2008)

²⁴ Bonney et al. (2009)

accumulation of insights about participant demographics and motivations and the ways in which participants have developed their skills and experience through crowdsourcing projects. The importance of ‘super contributors’ who often do most of the work on a project is also a common theme.

Institutional drivers behind the popularity of crowdsourcing include the sheer quantity of archival material and a desire to make better use of collections in the face of reduced funding for digitisation and other collections work. However, it appears that crowdsourcing projects also change the institution and related professions (see for example Chapter 9). While the potential savings in staff resources and enhancements to collections are the most obvious benefits of cultural heritage crowdsourcing, deepening relationships with new and pre-existing communities has been important to many organisations. Ultimately, the key trend in cultural heritage crowdsourcing is the pace and depth of constant change.

Looking to the future of crowdsourcing in cultural heritage

Currently, crowdsourcing in cultural heritage is mostly focused on using the capacity of interested publics to transform existing content from one format to another, and exploring the ‘wisdom of crowds’ through crowd-curation. However, projects like *Old Weather* (Chapter 2, see also Chapter 10) demonstrate opportunities for generating new knowledge and research questions, and there is great potential in archive-based participatory digitisation projects embedded in the work researchers are already performing, such as the Papers of the War Department. The discussion of *Transcribe Bentham* hints at future challenges ahead: improvements in machine learning

and computational ability to deal with tasks that were previously better (and enjoyably) performed by people – such as transcribing handwriting, OCR correction, describing images and discerning patterns – might render these activities less meaningful as crowdsourced tasks. Kittur et al offer a vision of ‘hybrid human-computer systems’ that ‘tap into the best of both human and machine intelligence’,²⁵ but the impact on cultural heritage crowdsourcing remains to be seen. However, crowdsourcing projects continue to evolve to meet these challenges and other changes in the digital and social landscape. For example, the genealogy site FamilySearch released a mobile application that allows people to transcribe small ‘snippets’ of text on their phone or tablet; a response to technological changes that also encourages participants to help even while ‘waiting to be seated at a restaurant’.²⁶

The structure and content of this book

The case studies in Part I offer insights into the genesis of various projects, the motivations of participants and practical lessons for interface design. Some focus on single projects while others present an overview of relevant activities across the whole organisation.

In Chapter 1, ‘Crowdsourcing in Brooklyn’, Brooklyn Museum’s Shelley Bernstein looks closely at three large-scale projects grounded in their collections, locale and audiences: *Click!*, a crowdsourced exhibition; *Split Second*, an experiment in responsive interpretation; and *GO: a community-curated open studio project*. She explores their roots in specific research

²⁵ Kittur et al. (2013)

²⁶ Probst (2012)

questions and in the museum's mission to engage the community. She explains how they were designed for very specific types of participation, and the cumulative impact of these initiatives on the organisation and its goals.

In Chapter 2, '*Old Weather: approaching collections from a different angle*', Lucinda Blaser explores the potential for citizen science projects to enhance historic collections while also producing genuine scientific results, explaining that in the *Old Weather* project, 'many users came for the climate science but stayed for the history'. She discusses how crowd-curation and data enhancement projects relate to Royal Museum Greenwich's mission, and how cultural heritage crowdsourcing and citizen science can unite the riches within collections with passionate and dedicated supporters.

In Chapter 3, "Many hands make light work. Many hands together make merry work": *Transcribe Bentham* and crowdsourcing manuscript collections', Tim Causer and Melissa Terras explain the considerable volume and variety of the archive on which University College London's *Transcribe Bentham* project is based. They review its value as an experiment with complex, challenging tasks – the opposite of the microtasks discussed elsewhere – and the validation required for scholarly editions, and re-evaluate their earlier assessment of the return on investment in crowdsourcing transcription. They also consider the impact of publicity, the importance of super-contributors and introduce their newly redesigned interface.

In Chapter 4, 'Build, Analyze, and Generalize: Community Transcription of the *Papers of the War Department* and the Development of *Scripto*', Sharon M. Leon describes the lessons learnt from developing the *Scripto* application for

community transcription of the distributed collections of the Papers of the War Department. She explains how it tapped into the existing user community, the process of generalising the tool for use as a transcription platform by other projects, and its place in the Roy Rosenzweig Center for History and New Media's philosophy of public history.

In Chapter 5, '*What's on the menu? Crowdsourcing at the New York Public Library*', Michael Lascarides and Ben Vershbow present the New York Public Library's *What's on the Menu* project, which aimed to turn historical menus into a searchable database, but was so successful at engaging the public that the library had to reorganise workflows to maintain the supply of menus. They discuss the factors that make a crowdsourcing project successful, the goals of various iterations in the interface design and the importance of their public mission to the project.

Lyn Lewis Dafis, Lorna M. Hughes and Rhian James discuss the National Library of Wales' crowdsourcing projects in Chapter 6, '*What's Welsh for "Crowdsourcing"?: Citizen science and community engagement at the National Library of Wales*', including the *Cymru1900Wales* place-name gathering project, the community content generation exercise around First World War material and their experiments around community transcription of wills for *Welsh Wills Online*. They relate these projects and crowdsourcing generally to the overall work of the library.

In Chapter 7, '*Waisda?: Making Videos Findable with Crowdsourced Annotations*', Johan Oomen, Riste Gligorov and Michiel Hildebrand present the design decisions behind the social tagging game *Waisda?* and consider the

impact of participatory culture on institutions. They elaborate on the results of extensive evaluations carried out in this long-term research project from the Netherlands Institute for Sound and Vision, one of Europe's largest audiovisual archives, and VU University Amsterdam, including two large-scale pilots involving thousands of users.

Kathryn Eccles and Andrew Greg discuss the *Your Paintings Tagger* project in Chapter 8, 'Your Paintings Tagger: Crowdsourcing descriptive metadata for a national virtual collection', including the project background and goals. They examine the impact of working with multiple stakeholders (including academics, the BBC and the Public Catalogue Foundation) and understandings of expertise, and the impact this had on design decisions and metadata standards. The results of user research, including a profile of taggers, their motivations for participation and the potential for providing a platform for community are discussed.

Part II of this book explores the challenges and opportunities of cultural heritage crowdsourcing, including the potential for better relationships with the public and new ways of thinking about informal education. These chapters also consider the implications of participatory projects for heritage organisations and professionals and current notions of authority.

In Chapter 9, 'Crowding out the Archivist? Locating Crowdsourcing within the Broader Landscape of Participatory Archives', Alexandra Eveleigh contrasts the hype around 'crowdsourcing' with the reality, reflects on the impact crowdsourcing has had on the archival profession, and makes a

significant contribution in her matrix for conceptually mapping the 'participatory landscape' in relation to archives.

In Chapter 10, 'How the crowd can surprise us: Humanities crowdsourcing and the creation of knowledge', Stuart Dunn and Mark Hedges examine crowdsourcing from an academic humanities perspective, looking beyond 'mechanical tasks' to 'the creation of complex content and the circulation of knowledge', and propose a valuable framework for thinking about humanities crowdsourcing in terms of assets, processes, tasks and outputs.

Lori Byrd Phillips reflects on the potential for a model of 'open authority' to meet the challenge organisations face in balancing institutional expertise with the potential of collaborative online communities. She draws on models from technology, education and museum theory to present solutions for addressing issues of democratization and voice in a fast-paced digital world in Chapter 11, 'The Role of Open Authority in a Collaborative Web'.

In Chapter 12, 'Making Crowdsourcing Compatible with the Missions and Values of Cultural Heritage Organizations', Trevor Owens considers the compatibility of crowdsourcing with the 'values and missions' of cultural heritage organisations, and concludes that the value of crowdsourcing lies not only in the productivity of the crowd but in 'providing meaningful ways for the public to enhance collections while more deeply engaging and exploring them'.

Taken together, these chapters not only provide an overview of current projects and practices – they also provide a glimpse of the ways in which audiences and institutions can together discover the future of crowdsourcing our cultural heritage.

References

1940 US Census Community Project. 2012. "We Did It! The 1940 US Census Community Project." <http://us2.campaign-archive2.com/?u=bode542dc933cfc848d187ea&id=c6e095aa92>.

Bonney, Rick, Heidi Ballard, Rebecca Jordan, Ellen McCallie, Tina Phillips, Jenifer Shirk, and Candie C. Wilderman. 2009. "Public Participation in Scientific Research: Defining the Field and Assessing Its Potential for Informal Science Education. A CAISE Inquiry Group Report". Washington D.C.: Center for Advancement of Informal Science Education (CAISE). <http://caise.insci.org/uploads/docs/PPSR%20report%20FINAL.pdf>.

Bratvold, David. 2011. "Defining Crowdsourcing's Taxonomy – A Necessary Evil." *Daily Crowdsourc*e. <http://dailycrowdsourc.com/2011/09/07/crowd-leaders/crowd-leader-david-bratvold-defining-crowdsourcings-taxonomy-a-necessary-evil/>.

Brohan, Philip. 2012. "One Million, Six Hundred Thousand New Observations." *Old Weather Blog*. <http://blog.oldweather.org/2012/07/23/one-million-six-hundred-thousand-new-observations/>.

Duff, Wendy M., Jennifer Carter, Joan M. Cherry, Heather Macneil, and Lynne C. Howarth. 2013. "From Coexistence to Convergence: Studying Partnerships and Collaboration Among, Libraries, Archives and Museums." *Info* 18 (3) (September). <http://informationr.net/ir/18-3/paper585.html>.

Estelles-Arolas, E., and F. Gonzalez-Ladron-de-Guevara. 2012. "Towards an Integrated Crowdsourcing Definition." *Journal of Information Science* 38 (2) (March): 189–200. doi:10.1177/0165551512437638.

Frankle, Elissa. 2011. "More Crowdsourced Scholarship: Citizen History." *Center for the Future of Museums*.

<http://futureofmuseums.blogspot.co.uk/2011/07/more-crowdsourced-scholarship-citizen.html>.

Gilliver, Peter. 2012. "'Your Dictionary Needs You': A Brief History of the OED's Appeals to the Public." *Oxford English Dictionary*. October 4.

<http://public.oed.com/the-oed-appeals/history-of-the-appeals/>.

Holley, Rose. 2009. "Many Hands Make Light Work: Public Collaborative OCR Text Correction in Australian Historic Newspapers". March. Canberra: National Library of Australia.

———. 2010. "Crowdsourcing: How and Why Should Libraries Do It?" *D-Lib Magazine* 16 (3/4) (April). doi:10.1045/march2010-holley.

<http://www.dlib.org/dlib/march10/holley/03holley.html>.

Howe, Jeff. 2006a. "The Rise of Crowdsourcing." *Wired*, June.

http://www.wired.com/wired/archive/14.06/crowds_pr.html.

———. 2006b. "Crowdsourcing: A Definition." June 2.

http://crowdsourcing.typepad.com/cs/2006/06/crowdsourcing_a.html.

———. 2008. *Crowdsourcing: Why the Power of the Crowd Is Driving the Future of Business*. 1st ed. Crown Business.

Kittur, Aniket, Jeffrey V. Nickerson, Michael Bernstein, Elizabeth Gerber, Aaron Shaw, John Zimmerman, Matt Lease, and John Horton. 2013. "The Future of Crowd Work." In *Proceedings of the 2013 Conference on Computer Supported Cooperative Work*, 1301–1318. <http://dl.acm.org/citation.cfm?id=2441923>.

Kosmala, Margaret. 2013. "Some Results from Season 4." *Snapshot Serengeti Blog*. <http://blog.snapshotserengeti.org/2013/01/30/some-results-from-season-4/>.

Probst, Danie. 2012. "New FamilySearch Indexing App Now Available." *LDSTech*. <http://tech.lds.org/index.php/component/content/article/1-miscellaneous/455-new-familysearch-indexing-app-now-available>.

Raddick, M. Jordan, Georgia Bracey, Pamela L. Gay, Chris J. Lintott, Phil Murray, Kevin Schawinski, Alexander S. Szalay, and Jan Vandenberg. 2010. "Galaxy Zoo: Exploring the Motivations of Citizen Science Volunteers." *Astronomy Education Review* 9 (1): 18.

Ridge, Mia. 2013. "From Tagging to Theorizing: Deepening Engagement with Cultural Heritage through Crowdsourcing." *Curator: The Museum Journal* 56 (4) (October).

Secord, Anne. 1994. "Corresponding Interests: Artisans and Gentlemen in Nineteenth-Century Natural History." *The British Journal for the History of Science* 27 (04): 383–408. doi:10.1017/S0007087400032416.

Trouille, Laura. 2013. "Galaxy Zoo Quench – Experience the Full Scientific Process." *Galaxy Zoo*. <http://blog.galaxyzoo.org/2013/07/10/galaxy-zoo-quench-experience-the-full-scientific-process/>.